MARCH 1951

FOUNDRY

...WHEREVER METALS ARE CAST

TECH GY DEPT

Casting Steel Crankshafts—page 84
Anthracite for Cupolas—page 96
Foundry News Report—page 33
Editorial Contents page 3

Foundries that specialize in Quality Castings flux and desulphurize with PURITE

A modern cupola and forehearth installation used in the manufacture of farm equipment parts and critical machine castings at the Lynchburg Foundry Company, Lynchburg Plant.

Lynchburg Foundry Company—**long famed for casting quality farm equipment parts, castings for the chemical industry, critical machine parts and iron pipe—relies on Purite to give increased fluxing action in cupolas and to reduce sulphur in ladle or forehearth.**

Here's why so many leading foundries use Purite:

- Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle.
- Purite gets to the iron quicker—no faster desulphurizer made.
- Purite is time-tested and proven for unsurpassed desulphurizing uniformity.
- Purite comes in 2-lb. pigs—no weighing or measuring required.
- Purite is 100% fused soda ash—you do not pay for inert materials.
- Purite does not crumble—no waste—no dust.
- Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.

PURITE TRADE MARK is sold by all leading foundry supply houses in the United States and Canada.

Nearly 30 years of successful experience prove why Purite is today's outstanding flux and desulphurizer. Get full information on Purite's effectiveness—write today for new booklet, "Refining and Desulphurizing in the Cupola." Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.

PURITE 100% fused soda ash.

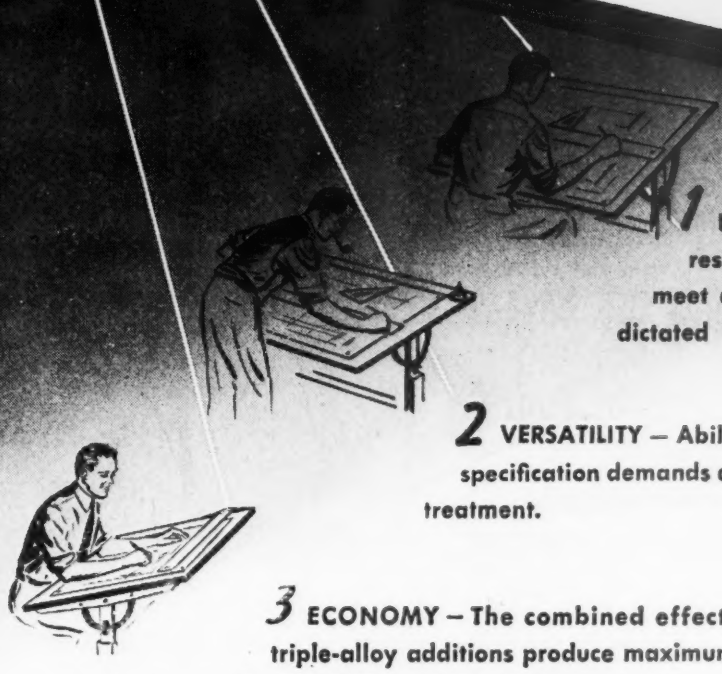
The Scientific Flux for Better Melting and Cleaner Iron.

Mathieson CHEMICALS

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

Triple reasons for specifying...

TRIPLE ALLOY STEEL CASTINGS *containing* NICKEL



1 PERFORMANCE—Strength and toughness, resistance to wear, fatigue or shock to meet a wide range of requirements, as dictated by design.

2 VERSATILITY – Ability to meet varied specification demands after suitable heat treatment.

3 ECONOMY – The combined effects of triple-alloy additions produce maximum hardenability at low alloy cost.

Triple-alloy steel castings have established outstanding service records in some of the most exacting industrial applications. Many of the lower alloy types can be handled in the shop with techniques not differing greatly from those employed with carbon steels.

We invite inquiries regarding the production, treatment or uses of triple-alloy steels, containing Nickel.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

READY?

How about seacoal?

You'll need the best...

CROWN HILL, of course!

Once more, foundries are called upon to render maximum service to the nation. To meet defense demands—to insure fast, efficient production, you'll need the best in supplies. In seacoal, of course, this means CROWN HILL. Because it is made from highly volatile, quick-flash coal, CROWN HILL produces a smoother finish, lowers cleaning costs, holds defects to a minimum. So, when making your plans for the emergency—don't forget CROWN HILL!

FIGURES FROM BUREAU OF MINES, DEPT. OF INTERIOR OF THE U. S.

(Moisture Free)

PROXIMATE ANALYSIS

Volatile Matter	38.9%
Fixed Carbon	57.4%
Ash	3.7%
	100.0%

ULTIMATE ANALYSIS

Hydrogen	5.4%
Carbon	82.0%
Nitrogen	1.6%
Oxygen	6.6%
Sulphur	.7%
Ash	3.7%
	100.0%

Fusion Point of Ash 2980° F.

THE FEDERAL FOUNDRY SUPPLY COMPANY

Seacoal Plant
CROWN HILL, W. VA. • CHICAGO • DETROIT
MILWAUKEE • RICHMOND, VA. • ST. LOUIS
CHATTANOOGA • NEW YORK • UPTON, WYO.
Mines

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MARCH 1951

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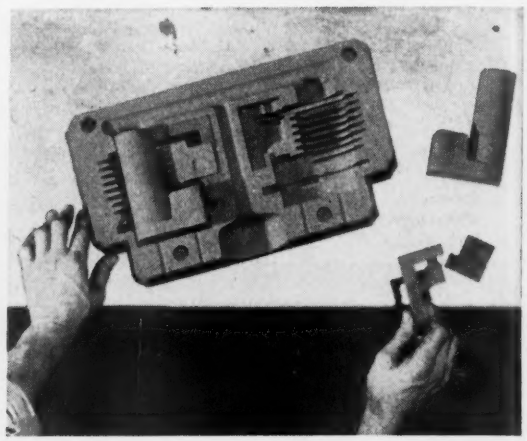
INDUCTOL

★ THE *New* "PRE-BAKED" CORE OIL

Oven Capacity Increased 50%

Cores Thoroughly Baked

Baking Time Cut in Half



Assembling the interior cores into a cylinder mold drag — Note: Two cylinders are cast together in a dry sand mold. Mold cope and drag sections are about 9" x 15" x 2½" thick. Interior cores for each cylinder consist of a barrel core, a port core and a wafer core.

OTHER ADVANTAGES NOTED

. . . **INDUCTOL ADDS GREEN STRENGTH**—Wells Foundry noticed that Inductol increased the green strength of their cylinder mixes to the extent that it was possible to eliminate 40% of the cereal.

. . . **INDUCTOL HAS GOOD COLLAPSIBILITY**—Cylinders were sound, free from flaws, and barrel cores rapped out easily.

. . . **INDUCTOL REDUCED SMOKE**—The reduction of smoke in the pouring area was noticeably reduced—another important consideration.

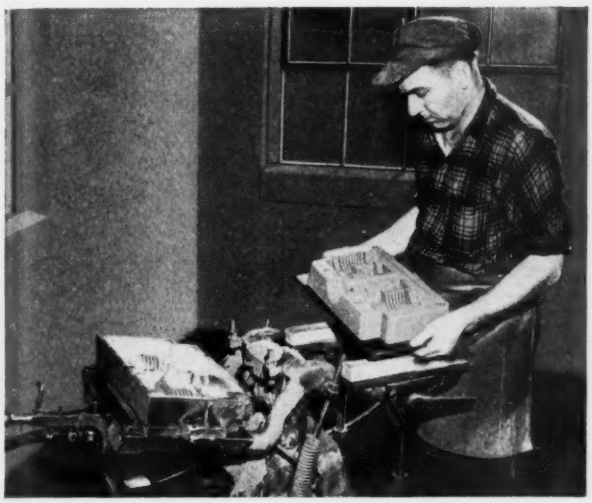
INDUCTOL has been tried with similarly outstanding success in more than 48 American foundries where baking problems had existed. If you have a special baking problem, ask your **LINOIL** man about **INDUCTOL**—He'll be happy to arrange for a demonstration.

ARCHER-DANIELS-MIDLAND COMPANY

(The Werner G. Smith Co. Division) • • 2191 West 110th Street, Cleveland 2, Ohio

Solves Baking Problems

on tricky air-cooled Cylinder Cores at Wells Foundry, Ltd., London, Ontario



A green mold section, ready to go to oven.

Coreroom Foreman Tommy Monger, inspecting a mold section as it leaves the baking zone.

PROBLEM . . . Wells Foundry, Ltd. in London, Ontario, Canada, really *had* a baking problem —Dry sand mold sections were baked in a tower oven, time cycle—90 minutes load to unload. Temperature 415°F. In order to be completely baked, each mold section had to make two trips through the core oven. Casting production was limited by the core oven capacity.

SOLUTION . . INDUCTOL was substituted for the regular core oil. Several mold sections were made. The coremaker declared the sand mix to be very workable. The molds were placed on the oven racks . . . the ideal baking characteristics of INDUCTOL did the rest—the tricky air-cooled cylinder cores were completely and *thoroughly baked in one oven cycle*—another bottleneck eliminated.

★INDUCTOL *IS DIFFERENT . . .* This clear amber core oil is "pre-baked"—in its manufacture, high temperatures and pressures serve to pre-polymerize the oil, thereby eliminating much of the oven drying time.

Free Data on INDUCTOL—Helpful information based on actual use in production.

LINOIL LOGICAL

ASK YOUR LINOIL MAN ABOUT

INDUCTOL

ARCHER • DANIELS • MIDLAND COMPANY
(THE WERNER G. SMITH COMPANY DIV.)
2191 West 110th Street • • Cleveland 2, Ohio

Please send me technical Bulletin No. F-108.

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Company .....

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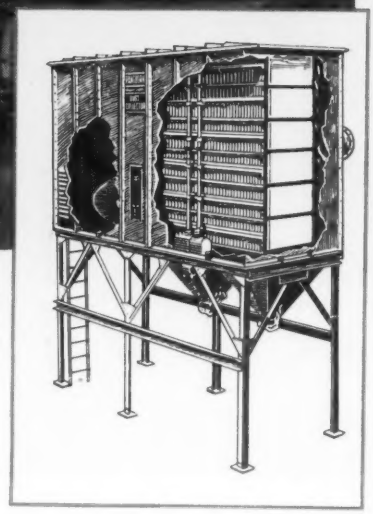
City and Zone ..... State .....

EXECUTIVES FIND

Pangborn Dust Control boosts foundry efficiency



Cutaway view of Pangborn "CH" Collector ➤

TAKE the dust out of a foundry and efficiency goes up! That's the experience of scores of executives . . . who protect their investment in equipment and manpower with Pangborn Dust Control.

Take the experience of the Penn Steel Castings Co., Chester, Pa. Their Pangborn "CH" Dust Collector is mounted directly outside the cleaning room. Its primary job is to protect the blast cleaning equipment from excess abrasive dust.

But equally important is the *dust-free working area.* Skilled workers are easier to get and to hold when bothersome dust is eliminated. In addition walls and windows stay cleaner longer and general maintenance costs average much less.

Don't let dust rob you of profits . . . find out about Pangborn Dust Control. Bulletin 909A gives the complete story. For your copy write to:

PANGBORN CORPORATION,
1400 Pangborn Blvd., Hagerstown, Md.

STOP THE DUST HOG
from stealing profits with

Pangborn

DUST CONTROL

Advertisement

If you haven't heard it . . .

IT'S NEWS!

ONE OF the main troubles with this world is that there are too many fellows always ready to reach for the stool when there is a piano to be moved.

* * *

FRED ALLEN says he enjoys long walks — especially when they are taken by people who annoy him.

* * *

SOME WAG has defined a wedding as an ocean of emotion surrounded by an expanse of expense.

* * *

GLASSES can have an amazing effect on a person's vision—especially when they have been filled and emptied several times.

* * *

SPEAKING OF VISION, have you taken a good look at your cleaning room setup lately? Is this department equipped to keep up with expanded facilities in other departments? Or could it become a bottleneck to slow the production of vital defense orders? These are days when you have to look ahead.

* * *

IT'S A funny world. Natives who beat drums to ward off evil spirits are objects of scorn to smart American motorists who blow horns to break up traffic jams.

* * *

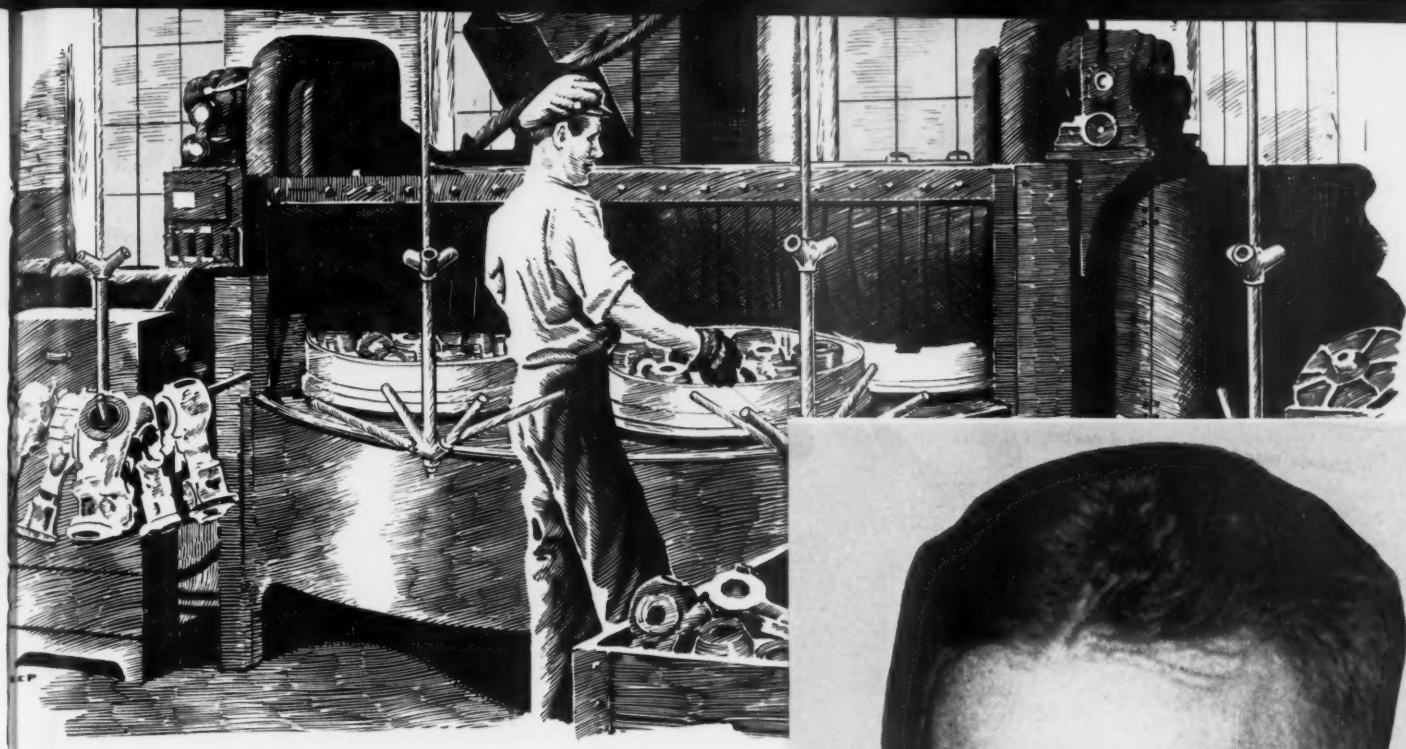
ONE THING most people overlook: there's a world of difference between 10 years' experience and repeating one year's experience 10 times.

* * *

THE RIGHT KIND of experience can be mighty important. And in two major fields—blast cleaning and dust control—Pangborn has experience to burn—the right kind, that is. This experience can be mighty important to you in your business. And it's available, free, at the drop of a postcard. It will pay you to write the Pangborn Corporation, Hagerstown, Maryland.

* * *

NOTE TO parents: even if you don't like television you can always use it to turn off, in lieu of a spanking.



M. F. Putz, Foundry Superintendent of Fairbanks, Morse

ROTOBLAST*

Ends Cleaning Room DOWN-TIME

at Fairbanks, Morse

PANGBORN ROTOBLAST pays off at the Freeport Works of Fairbanks, Morse with *no work stoppages* in the cleaning room. As M. F. Putz, Foundry Superintendent puts it: "ROTOBLAST gives us good service with nominal repair. We like it!"

And the record backs him up. Castings with hard-to-clean pockets are cleaned down to virgin metal . . . with tiny cracks and imperfections exposed, which saves time on inspection time and rejects. One man plus the ROTOBLAST Table and Barrel handles the entire cleaning load (25,000 pounds of *small* castings) per 8-hour day!

ROTOBLAST can save you money on blast cleaning. *Look to Pangborn for the latest developments in blast cleaning and dust control equipment.*

More than 25,000 Pangborn Machines Serving Industry

Here's the Key to Low-Cost, High-Quality Blast Cleaning

Pangborn ROTOBLAST saves from $5000 a year to $50,000 a year. Specifically, ROTOBLAST builds savings these five ways . . .

SAVES LABOR: One ROTOBLAST machine and operator can do as much as, or more than, a two-man crew and old-fashioned equipment.

SAVES SPACE: In many cases, one ROTOBLAST machine replaces five or more old-fashioned machines.

SAVES TIME: Cases on record prove ROTOBLAST can cut cleaning time up to 95.8%.

SAVES POWER: Modern ROTOBLAST uses but 15-20 h.p. compared to 120 h.p. needed by old-fashioned equipment.

SAVES TOOLS: On work cleaned with ROTOBLAST, cutting tools last up to 2/3 longer because no scale is left to dull edges.

SEND FOR FREE BULLETIN! All ROTOBLAST machines are covered in Bulletin 214. Write for your free copy to: Pangborn Corporation, 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

*Trademark of the Pangborn Corporation

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

ABROAD—as at home... Champion

AZIENDE INDUSTRIALI VITTORIO NECCHI
MACCHINE PER CUCIRE
PAVIA (Italia)

UFFICIO VENDITA ESTERO

15 Dicembre 1950

Ril. 4231/250/CR

Messrs. CHAMPION FOUNDRY & MACHINE CO.
1553, W. Madison Street
CHICAGO 7 Ill. U.S.A.

Riferendoci alla fornitura di macchine a soffiare da Voi eseguita, dopo un anno di ininterrotto funzionamento siamo lieti di comunicarVi la nostra soddisfazione per la regolarita di lavoro ed i risultati qualitativi e quantitativi delle anime prodotte.

Esse hanno superato le nss. aspettative dimostrandosi superiori ai tipi fino ad oggi usati nellanostra fonderia.

Ci complimentiamo inoltre con Voi per la competente assistenza accordataci dal Vostro Rappresentante per l'Italia, Ditta Fratelli Musso di Torino.

Ci e grata l'occasione per porgerVi i nostri distinti saluti.

VITTORIO NECCHI S. p. A.
GHISA MALLEABILE
il Direttore
(Ing. G. Rossi)

Wherever Champion Core Blowers are in operation reports from users are uniformly enthusiastic in regard to performance, production, quality of product, and economy. The letter reproduced at the left, received recently from one of our overseas customers, is a typical example. The translation follows:

Gentlemen:

Reference is made to your Core Blower Machines' shipments and after one year of continuous functioning we are happy to inform you of our complete satisfaction of the results not only for quality but also for the quantity of the work produced.

They have surpassed all our expectations proving to be superior to any other machine of the same type used in our foundry.

We compliment you for your excellent and competent assistance together with your representative Fratelli Musso S. A. of Torino.

We take this opportunity to give you our sincere regards.

Yours very truly,
VITTORIO NECCHI S.p.A.
GHISA MALLEABILE
il Direttore

s/Ing. G. Rossi

Core room of the Necchi foundry, showing two CB 15 core blowers in foreground; behind them are two CB 10's. Conveyor at left of machines runs under the horizontal core oven.

Core Blowers

EXCEL in quality... in quantity!

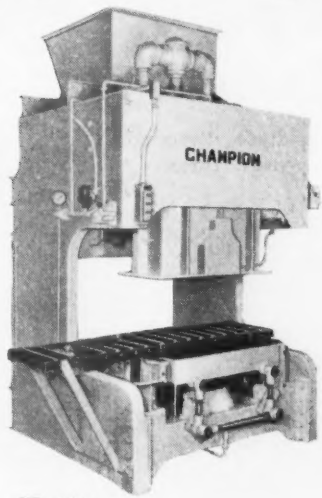
THEY'RE FAST The largest as well as the smallest Champion will fill any core box with well rammed sand as fast as the operator can place and remove it.

THEY'RE EASY TO OPERATE Effortless control is one feature of Champions that makes them high favorites of operators. Just an easy movement of the air valve, and whoosh! the box is filled.

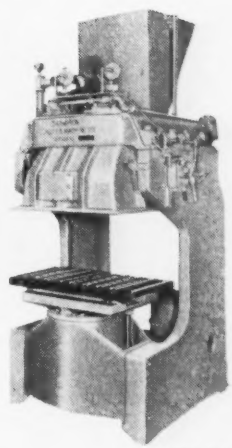
THEY'RE ACCURATE Every core comes out clean and true to the exact contour of the box. Large sectional cores are assembled without jigging or grinding.

THEY'RE ECONOMICAL Standard 85 lb. air lines, no boosters, are adequate to assure positive operation. Large cores are blown in one piece.

When Champions go in, big savings always follow. Let us give you a few "case histories." Write us, today.



CB 400



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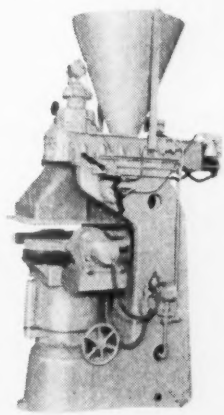
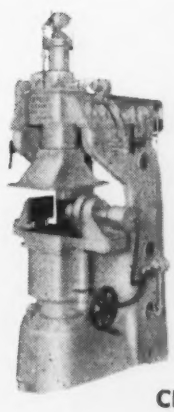
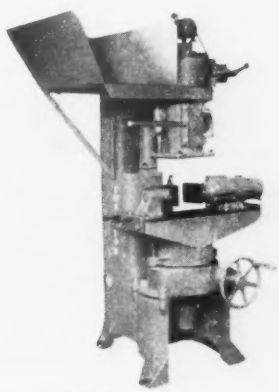


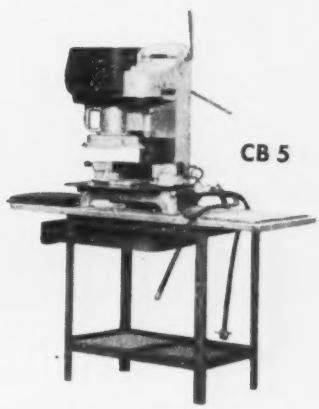
CB 15



CB 12



CB 10



CB 5

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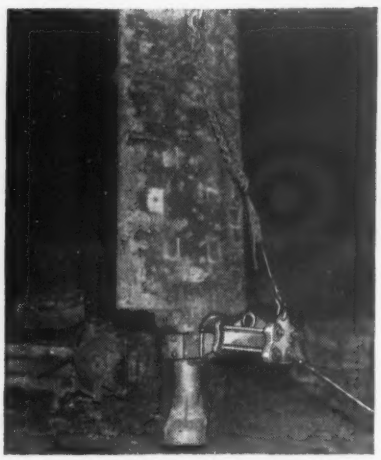
"BRANFORD" Vibrators

BIG SAVINGS
in removing cores from castings with
"BRANFORD"
Pneumatic Rappers

"BRANFORD" Rappers save time and labor in core and flask shakeout.



Here's a 5" "BRANFORD" RAPPER removing sand core from a 3½ ton gate casting for a hydro-electric plant. Rapper is attached to sprue by a cast bracket specially designed by user to take head of the "BRANFORD" rapper.

The same casting completely cleaned in two hours with one man in attendance. This job formerly took two men one full day.

Send us sketch of casting, specifications, and composition of core and we will quote on proper equipment.

Photos courtesy Penn. Elec. Steel Casting Co.

NEW HAVEN Vibrator Company

130 Chestnut Street
New Haven, Conn.

With the EDITORS

WELL DESERVED AWARD: Society of Business Magazine Editors (FOUNDRY, July, 1950, page 216) staged a business mobilization dinner in Washington on Jan. 19, which drew national attention because many big shots in the government either were on the program or among the 600 in attendance. President Truman

came over to the Statler after the dinner to present Paul Wooton of the Chilton Co. and executive president of the society with the annual Silver Quill award of National Business Publications for "most distinguished service to the business press through his development of better understanding and more productive co-operation between the various agencies of the federal government and the trade, technical, scientific and professional publications of America." Congratulations, Paul, on this richly deserved award.

—o—

Pledging Support: Realizing that individual production means everything in any war effort, the society, which includes in its membership the editors of major publications serving all industrial America, went on record with the following resolution:

Whereas it is now clear that we who believe in the freedom of mankind are involved in a great world struggle with those who do not, and

Whereas this struggle may be the last opportunity to prove that free labor led by free management can produce more than slave labor under dictators.

Therefore, be it resolved that:

We, who enjoy individual freedom as independent editors of America's business magazines do hereby pledge ourselves as editors to arouse and support the kind of productive effort that will demonstrate the omnipotent power of the free spirit.

And be it further resolved that:

A copy of this resolution be delivered to the President of the United States, to the Director of Mobilization and to the Director of Production.

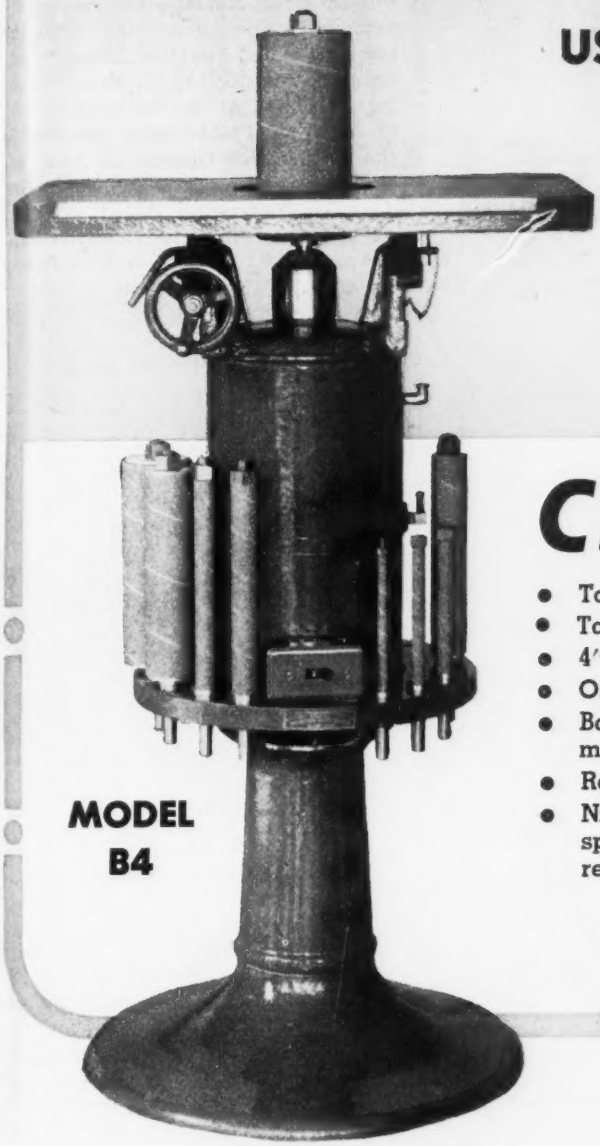
—o—

Travel: Sickness of railroad workers and one of Grandpa's old fashioned winters took much of the pleasure out of traveling, but did not slow down editorial trips to any great extent. During the first six weeks of the new year, Bill Gude visited government agencies in Washington to obtain material for the "Foundry News Report" in the February issue. Bob Herrmann visited the Western New York Chapter to obtain information on the coming AFS annual

(*Concluded on page* 12)

The National Production Authority asked a number of business paper representatives to meet in Washington Jan. 17 to consider defense problems in the field of metals. Managing Editor Bill Gude is sixth from the left

USE FREEMAN EQUIPMENT
IN YOUR PATTERN SHOP
FEWER DELAYS
AND MORE PRODUCTION
WITH A STATE OSCILLATING SPINDLE SANDER



MODEL B4

CHECK THESE FEATURES

- Table tilts 45° by worm and gear device.
- Table quickly returned to exact horizontal position.
- 4″ hand wheel for tilting.
- Oscillating mechanism runs in oil.
- Ball bearing motor enclosed in machine base.
- Rectangular table 20″ x 24″.
- Nine quick change spindles (as shown) ready for use.

MODEL D20

STATE 20″ DISC SANDING MACHINE

This moderately priced, precision built, quality machine is another addition to the already famous line of STATE DISC and SPINDLE SANDERS designed and built especially for the pattern shop.

Write for Bulletin No. 49-10-10

THE FREEMAN SUPPLY CO.

Pattern Shop and Foundry Supplies and Equipment

Mahogany and Pine Pattern Lumber

1153 E. BROADWAY TOLEDO 5, OHIO

More production per grinding wheel dollar. That's why George is the boss's brainy boy. How did he get that way? Simply by changing over to a grinding wheel slightly different in grain and grade . . . a Simonds wheel, naturally. This could be a right, bright production boosting idea for you too. You'll find everything you need in our complete line . . . grinding wheels, mounted wheels and points, segments, abrasive grains. Let's send you our free Data Book and the name of your nearby Simonds Abrasive Company distributor.

SIMONDS ABRASIVE CO.
grinding wheels

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA.

DISTRIBUTORS IN ALL PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

(Concluded from page 10)

convention in Buffalo. The editor attended a meeting of the Foundry Equipment and Supplies Industry Advisory Committee to NPA in Washington, called at the national offices of ASTM in Philadelphia and visited the Philadelphia Chapter of AFS, attended a meeting of the National Industrial Conference Board at New York, spoke before the Chicago Chapter of AFS, covered the industry meeting of the Malleable Founders' Society and the winter meeting of the National Castings Council. As this is written, Bill Gude, Ed Bremer, Erle Ross and Al Johansen are off to the Wisconsin Regional.

—o—

A Poem: A number of people noticed the poem entitled "Foundry" which appeared in the *Saturday Evening Post* Dec. 16, 1950, page 58, and suggested that it be reproduced in FOUNDRY. We passed along the suggestion to the *Post,* and received permission, provided we include "Reprinted by special permission of *The Saturday Evening Post.* Copyright 1950 by The Curtis Publishing Co." That small detail out of the way, here is the poem:

FOUNDRY
By Richard Pedler

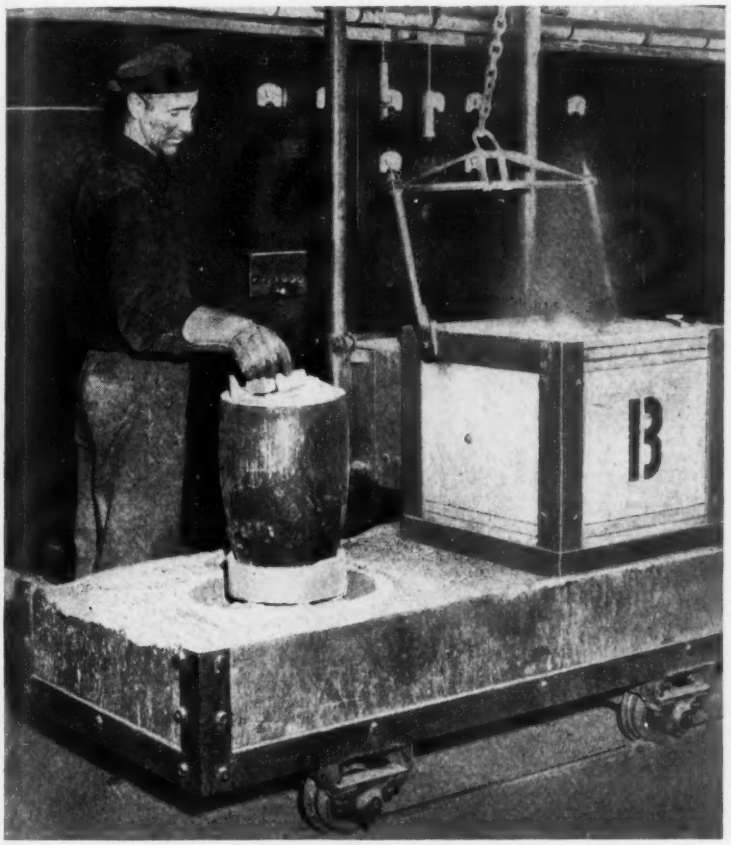
This smoking steel inferno sprawls
  Beneath an orange smudge-pot sky
In miles of battered concrete walls
  And rusting scrap heaps, mountain high.
Here is a world where men may feel
A torrid breath of liquid steel,
A brow of sweat, a stinging gust
Of shake-out dirt and silica dust,
And hear the crushing tremolo
Of thunder drums in molders' row,
And smell the acrid stench of sand
As molten metal burns its brand,
And see hot overflow that starts
A spitting hail of dagger darts,
And cupolas that scorch the night
With fire fists of flaming might.

For years we have contended that the foundry industry provided high interest and romance. But for some reason, we have looked at some of the more pleasant features of casting production for romance. Guess we do not have the soul of the poet.

—o—

Thanks: The editors appreciate greatly the many kind comments on the changes which were made with the January issue. Our new type of editorial cover seems to meet with general approval, and many foundrymen have told us the "Foundry News Report" which appears on pages 33 and 34 of this issue, provides a valuable look at the latest developments, with special emphasis on Washington. Thanks so much for telling us these things.—F.G.S.

NON-FERROUS MELTING



You can do it faster ...more economically

WITH

AJAX-NORTHRUP INDUCTION FURNACES

Want heat after heat of hard-to-handle alloy with never a complaint of contamination? At high production speeds? Without fussing around? Economically? . . . Only one furnace will do it every time—the Ajax-Northrup high frequency furnace. Melts so fast there's no time for oxidation. Nothing to contaminate. Stirs as it melts. Crucible life is long, and melting cost per pound is amazingly low. Lift coil types permit regular crucible melting. Tilting types handle larger charges, often can be poured right into the mold. Thousands are now in use—in sizes capable of handling any and all of your toughest melting jobs—cleaner and faster than you thought. Worth looking into. Ask the men who use them—or write us.

AJAX ELECTROTHERMIC CORPORATION
AJAX PARK, TRENTON 5, N. J.

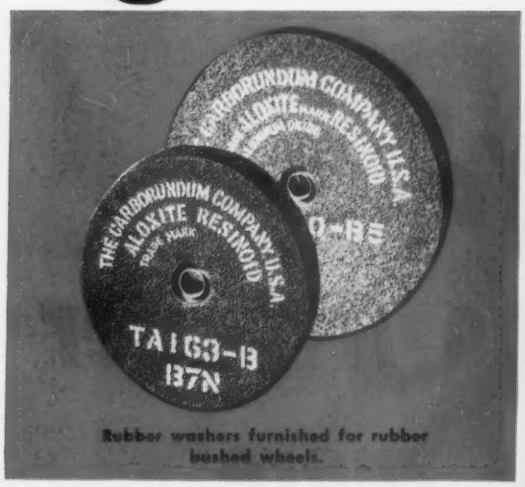
Associate Companies

AJAX ELECTRO METALLURGICAL CORP. • AJAX ELECTRIC COMPANY, INC.
AJAX ELECTRIC FURNACE CORPORATION • AJAX ENGINEERING CORPORATION

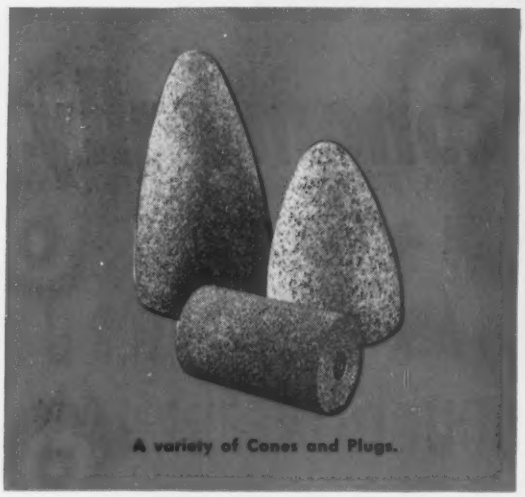
121

HEATING & MELTING

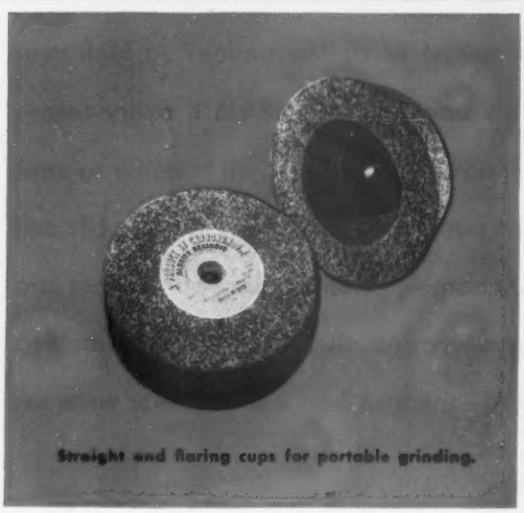
High Level PRODUCTIVITY



Rubber washers furnished for rubber bushed wheels.



A variety of Cones and Plugs.



Straight and flaring cups for portable grinding.

Mounted points for every portable grinding operation.

CARBORUNDUM's *complete* line of bonded products for general purpose and weld grinding expedites a high rate of production at lowest cost with the *right* abrasive for every grinding operation. Typical of these high-efficiency bonded products is our new *rubber bushed* Type 1 Portable Grinding Wheel—a specially-designed product with *built-in* rubber bushing that lessens operator fatigue by dampening wheel vibration. Greater production efficiency and improved finishes result from reduced wheel "bounce" which results in more continuous wheel contact. See your CARBORUNDUM representative for full details.

Only CARBORUNDUM

TRADE MARK

makes ALL abrasives to give you the proper ONE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N. Y.

SAVE DRYING AND HANDLING TIME

Cut Fuel Costs—Boost Quality

COSTS ARE SAVED during every step of the core making process using the simple *Foundromatic* Dryer way of drying cores. Drying time is cut 80%. Fuel costs are 30% to 60% less. And, there's less handling, less storage required, because cores can be made up as needed in a few minutes. No cooling or curing required.

In addition, working conditions are improved by the elimination of heat and fumes from the core room. Rejects are practically eliminated because overbaking of cores, or burning of thin sections is impossible. Even casting cleaning is cheaper, because cores shake out without hand cleaning.

Any core that will pass through an aperture 36 inches wide and 13 inches high can be dried in the *Foundromatic* Sand Core Dryer. Call on Allis-Chalmers unique combination of foundry knowledge and electronic skill to help you study your core room. Contact your nearby Allis-Chalmers District Office, or write Allis-Chalmers, Milwaukee 1, Wis.

A-3259

Foundromatic is an Allis-Chalmers trademark.

OLD WAY

FOUNDROMATIC DRYER WAY

3 STEPS YOU CAN ELIMINATE

1. Eliminate collecting racks. Cores are placed directly onto the moving conveyor belt of the *Foundromatic* Sand Core dryer.

2. Eliminate cooling racks. When cores come out of dryer, they're cool enough to be handled bare-handed.

3. Eliminate curing and storage racks. Cores can be made as needed in a matter of minutes, without building stocks on curing and storage racks.

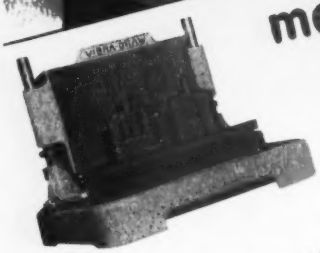
ALLIS-CHALMERS

ATLANTIC FOUNDRY
is now using three SAN-BLO's

K. G. Marshall, Superintendent of Production, Atlantic Foundry Co., Akron, advises that prior to last July, when they installed their first SAN-BLO, they made all cores by hand because they were unable to find a core blower to take care of their requirements. Now, they have three SAN-BLO's operating full time—blowing ALL sand mixtures.

Your foundry, too, can use SAN-BLO profitably (whether jobbing or production—iron, steel or non-ferrous). Write today for new bulletin, No. CB-2, for complete information.

memo



Atlantic Foundry uses VIBRA-DRAW core drawing machines and SAN-BLO core blowers for faster production (see photo above). Vibrating head makes drawing easy--a perfect core every draw. Experience isn't necessary.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

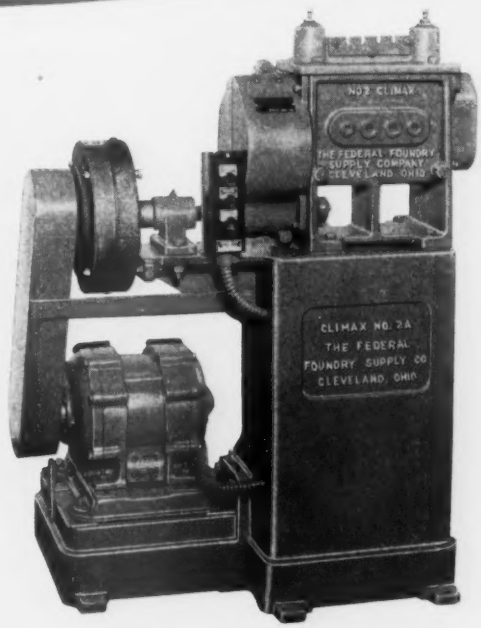
THE FEDERAL

CHICAGO DETROIT MILWAUKEE NEW YORK
CHATTANOOGA RICHMOND, VA. LOS ANGELES

LOOK TO FEDERAL
for better foundry equipment

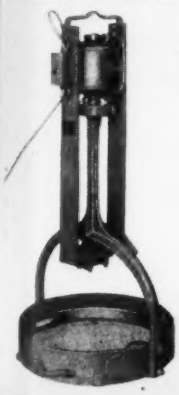
WHIRLMIX Sand Mixer

Flexible, whirling arms mix sand safely—no overheating, no crushing of sand grains. Produces fluffy, aerated, thoroughly mixed sand. Small, compact, easily moved. Mixes up to 4,000 lbs. per hour.



CLIMAX Wire Straightener

Having trouble getting wire? No need to worry —you can reclaim used wires and rods with a CLIMAX. Easily and safely operated by unskilled labor. Six models offer choice of drives and full range of wire sizes.

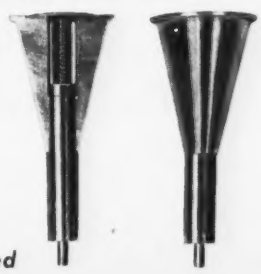


LOWE Sifter

Here's a highly efficient, portable, electric sifter. Reduces costs through faster sifting and better sand conditioning. Maximum screening area and shoveling room. Rugged construction, enclosed ball-bearing motor.

SHUR-SPOT Sprues

For squeezer-made molds. Squeezes down with sand. When squeezer board is removed, it pops up to be lifted out. Leaves completed, properly located pouring sprue.



***FEDERAL FOUNDRY** manufactures all equipment illustrated*

FOUNDRY SUPPLY COMPANY

3600 EAST 71st STREET · CLEVELAND 5, OHIO

PROVEN DEPENDABILITY YEAR IN—YEAR OUT

PLUS *LOW-COST OPERATION*

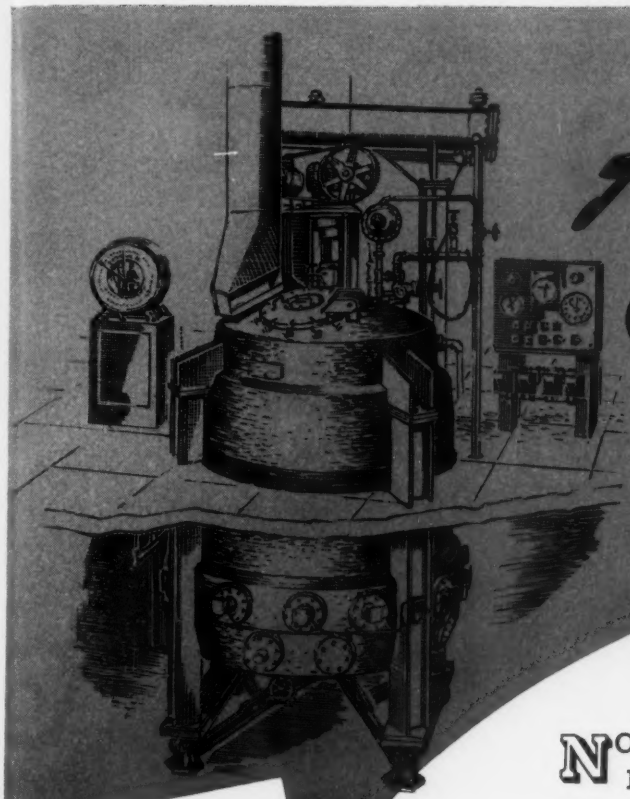
(Installation of 1,000,000-volt unit — Campbell, Wyant and Cannon, Muskegon, Mich.)

General Electric Industrial X-Ray is a production tool that often pays for itself on the first job!

Scores of companies rely on radiography for that extra measure of assurance that comes from knowing — not guesswork. The high-voltage industrial x-ray unit illustrated above is noted for its low-cost operation and absolute dependability. Developed to high efficiency to satisfy the hectic production demands of World War II, it ideally meets today's foundry needs — both in the laboratory and on the production line.

Here's the experience of a Michigan automobile manufacturer: "An outstanding example of the contribution of radiography to the improvement of production processes resulted when examination of one type of crankshaft showed lack of fusion at the chill and pointed the way to improved techniques resulting in a savings conservatively estimated by the company to be $250,000 on a year's production." Write for booklet: "Radiography as a Foundry Tool." General Electric X-Ray Corporation, Dept. YY3, Milwaukee 14, Wisconsin.

GENERAL ELECTRIC X-RAY CORPORATION



Aqua-Set CORE BINDERS Save COSTS

NOW, more than ever before, AQUA-SET CORE BINDERS are the answer to high priced Linseed Oil. Resin type binders are made without Linseed or other drying oils and they pay out three ways;

1st: In the lower initial cost of your core sand mix.

2nd: In a faster bake. Up to one-half normal baking time can be saved.

3rd: In lower cleaning room costs.

Aqua-set "50", a phenolic type of binder, is tops for Grey Iron and Steel.

Aqua-set "L", a urea type of binder, is a must for magnesium and aluminum.

These products have proved their value for foundry work and now they are favored from a price angle also.

AQUA-SET
AQUA-SET
AQUA-SET
AQUA-SET
AQUA-SET
AQUA-SET

Write us today for complete information on Aqua-Set Core Binders

UNITED

UNITED OIL MFG. CO.

1429 Walnut Street · ERIE, PA.

TO ALL outward appearances any two grades of shot or grit may appear to be as much alike as peas in a pod—but there the similarity ends. Rarely do they perform alike.

In using HI-GRADE Shot and Grit you'll find there IS a difference . . . a recognizable value far beyond purchase price that shows up in extra performance on the job.

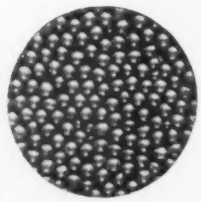
Though you may be satisfied with the material you are now using, it is just good business not to deny the promise of uniform, lower cost, more efficient blast-cleaning which HI-GRADE Shot and Grit can fulfill for you.

You can't be blamed for wanting longer use-life in the abrasives you use—more efficient cleaning and peening—a better finish in less time. Get these advantages with HI-GRADE Shot and Grit. Requisition a trial quantity today. You'll never regret it.

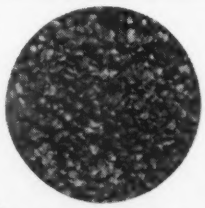
Packed in 100 lb. Bags—Ready for Immediate Shipment

METALLIC

SHOT HI-GRADE GRIT



HI-GRADE SHOT
UNIFORM SIZE AND HARDNESS
Withstands repeated strain, stress and wear. Exclusive alloying and tempering process helps prevent rust; minimizes impact fractures.



HI-GRADE GRIT
SHARP, TOUGH AND DURABLE
Made of same material and processed by same methods as Hi-Grade Shot. Cleans with maximum efficiency. Reduces equipment wear and maintenance costs.

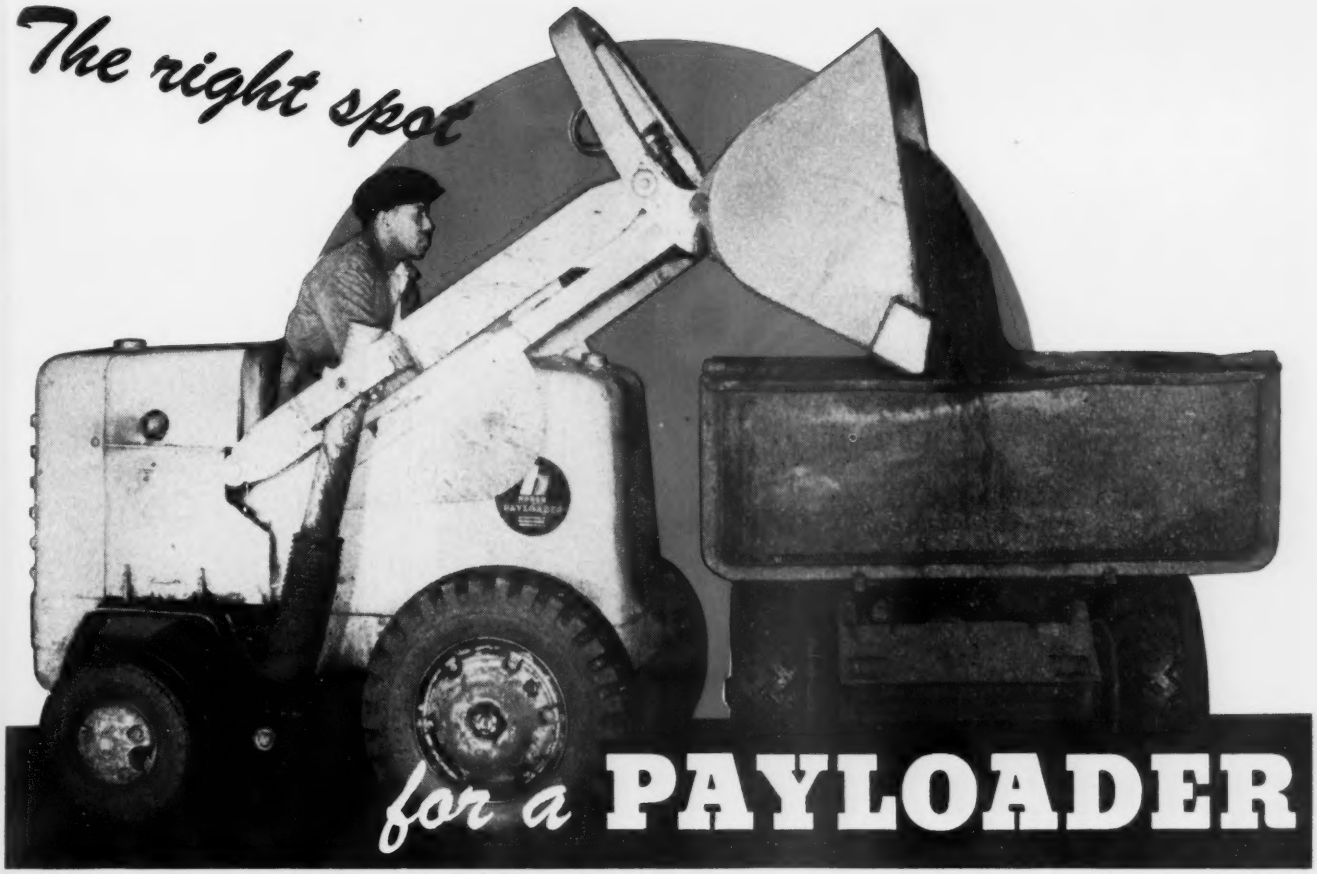
HI-GRADE SHOT AND GRIT MORE THAN MEETS S.A.E. SPECIFICATIONS—SCREENED AND GRADED FOR 100% USAGE

Clayton-Sherman *Abrasives Company*

MANUFACTURERS OF *QUALITY-CONTROLLED* SHOT AND GRIT

Representatives in Principal Cities

3896 LONYO ROAD ★ DETROIT 10, MICHIGAN



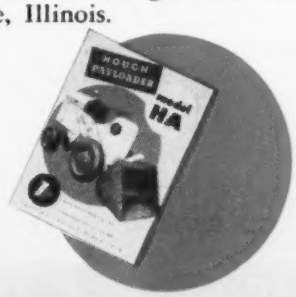
What is the right spot for a PAYLOADER? It's any place inside your buildings or in the yard where bulk materials are being handled by laborious or other obsolete methods. Thousands of these special tractor-shovels are in "right spots" *today* cutting costs, solving manpower shortages and increasing output.

PAYLOADERS are able to pay for themselves in a few months because they are designed for the specific job of handling bulk materials of all kinds — loading, unloading, scooping, lifting, carrying, dumping and spreading. Outstanding reasons for the performance and acceptance of PAYLOADERS include: short, compact, space-saving design; multiple reverse speeds; large pneumatic tires that permit operation indoors and outdoors . . . on paved or unpaved areas; simple, easy operation; complete hydraulic bucket control.

The 12 cu. ft. model HA shown is an outstanding box car unloader. It is the smallest of six PAYLOADER sizes which range up to 1½ cu. yd. bucket capacity. Every PAYLOADER is backed by 30 years of manufacturing experience and by a world-wide Distributor service organization. The Frank G. Hough Co., 703 Sunnyside Avenue, Libertyville, Illinois.

- **Unload box cars.**
- **Carry sand, coke, scrap limestone, etc., to storage.**
- **Transport and distribute sand to molding stations.**
- **Remove used sand from floors.**
- **Windrow sand for the cutter.**
- **Charge mullers, tumbling barrels.**
- **Feed conveyors, elevators, hoppers, mixers.**
- **Clean up gangways, aisles and other areas.**
- **Handle scrap, small castings, slag.**
- **Lift-haul-push-pull.**

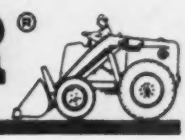
Write for literature on PAYLOADERS and the name of your Hough Distributor. He'll be glad to help you find the "right spot" for the right size of PAYLOADER in your operations. No obligation.

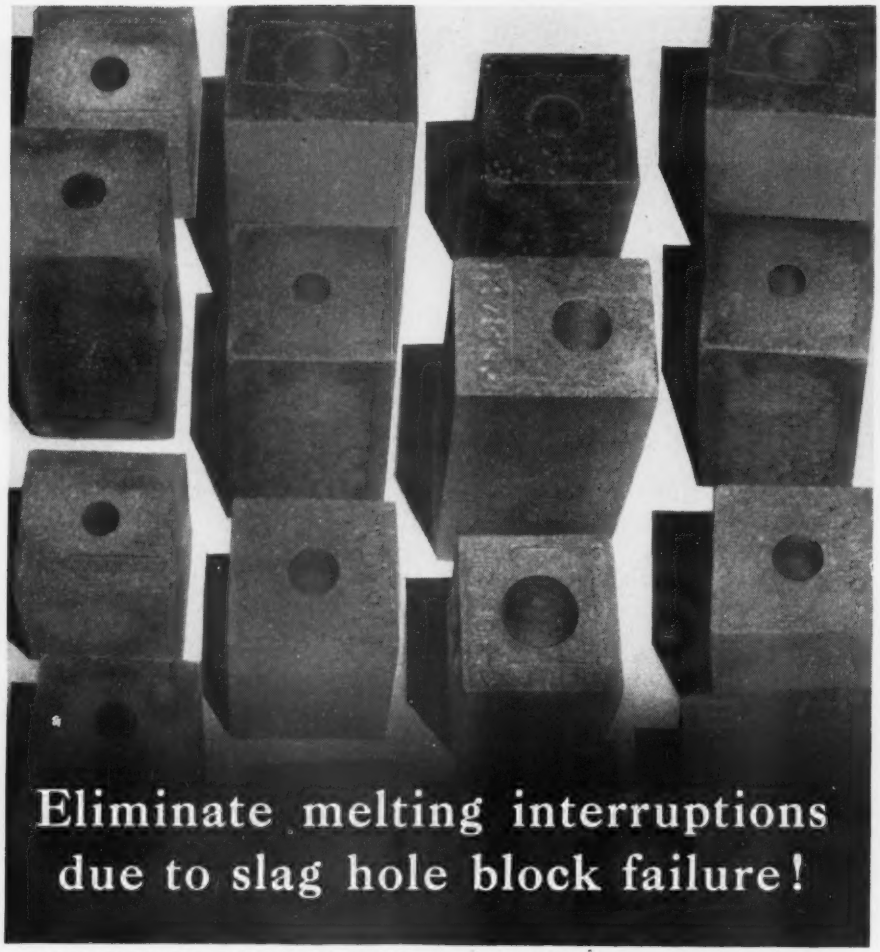


SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. · *Since 1920*





Eliminate melting interruptions due to slag hole block failure!

NORTON CRYSTOLON SLAG HOLE BLOCKS LAST LONGER because these densely bonded, chemically inert silicon carbide blocks resist corrosion, erosion and penetration of slag 5 to 15 times longer than fire clay blocks.

More and more foundries, fed up with interruptions of melting campaigns due to slag hole block failure, are replacing fire clay blocks with silicon carbide blocks made of Norton Crystolon* refractory. You can profit from their experience.

Look at what you'll get. No softening or spalling at temperatures up to 3050° F. Resistance to slag corrosion, erosion and penetration 5 to 15 times longer than fire clay blocks. More production per shift.

Test Crystolon Blocks!

It will pay you to compare the performance of Norton Crystolon slag hole blocks with whatever you are now using. For prices and complete information, contact your nearby Norton representative or write us direct. Norton Company, 303 New Bond St., Worcester 6, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON

TRADE MARK REG. U. S. PAT. OFF.

Making better products to make other products better

Special REFRACTORIES

Canadian Representative

A. P. GREEN FIRE BRICK CO., Ltd. TORONTO, ONTARIO

New Bulletin on Refractory Cements...

Offers valuable guides to top performance

Everything you need to know about refractory cements is covered in this fact-packed bulletin:

HOW TO SELECT the right fused alumina, silicon carbide or fused magnesia cement for metal melting, brick laying, resistor imbedding, or ramming burner tunnels. This subject is covered by two comprehensive, cross reference tables.

HOW TO PREPARE refractory cement for casting, troweling, ramming and pressing—is thoroughly covered.

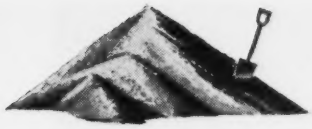
HOW TO APPLY refractory cement by the various methods — is treated in great detail.

Get Your Free Copy

This bulletin, result of exhaustive laboratory field tests by Norton refractory engineers, will make a valuable addition to your library of refractory information.

Write for Bulletin 863

NORTON COMPANY
303 NEW BOND STREET
WORCESTER 6, MASS.



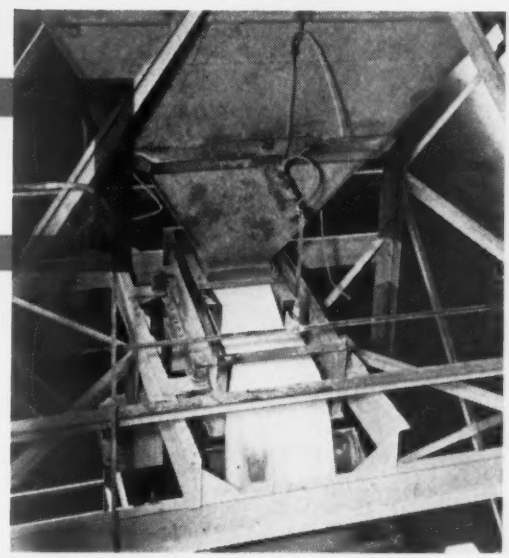
If sand won't flow your foundry can't go!

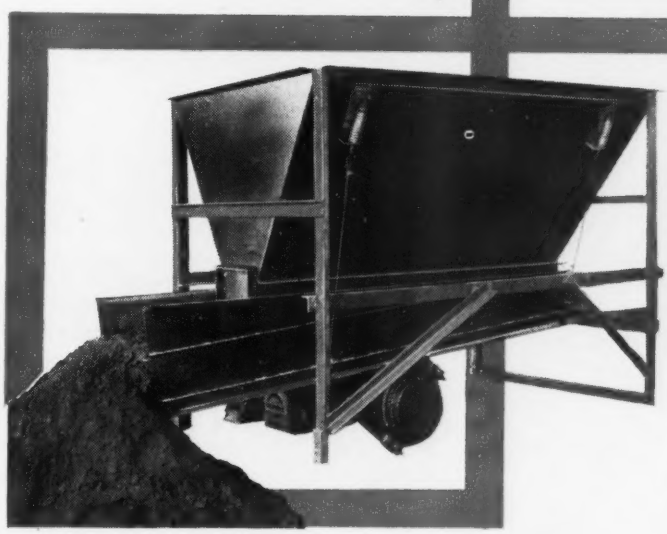
install Simplicity os-a-veyor type bin feeders

Sand stoppage in your storage bins means lost time on the molding floor and lost production all along the line. You can stop these time losses with Simplicity Os-A-Veyor Type Bin Feeders that greatly reduce the danger of sand bridging and hanging in the bins. Simplicity Feeders, available in lengths from 4′ to 20′ and widths from 12″ to 6′, feed from the full length of the bin. Quality of sand is also improved because the sand can temper in the bin with actual temper time dependent upon capacity of bin and rate of feed. Molding sand will flow when you want it and a brake type motor on the feeder insures accurate measurement of sand. Improve your molding sand, improve your castings, and improve your production time with Simplicity Os-A-Veyor Type Bin Feeders.

18″ x 9′ Model OA Simplicity Feeder

2′ x 5′ Simplicity Bin Feeder in operation at a big industrial foundry.





2′ x 10′ two-surface Feeder installed under test bin. In actual operations, a 3′ x 17′ feeder of this type installed at the Buick foundry, Flint, Michigan, handles, at a uniform controlled rate, 100 tons per hour of finished, mulled, and tempered sand feeding from a 150 ton capacity through a 14′ long opening.

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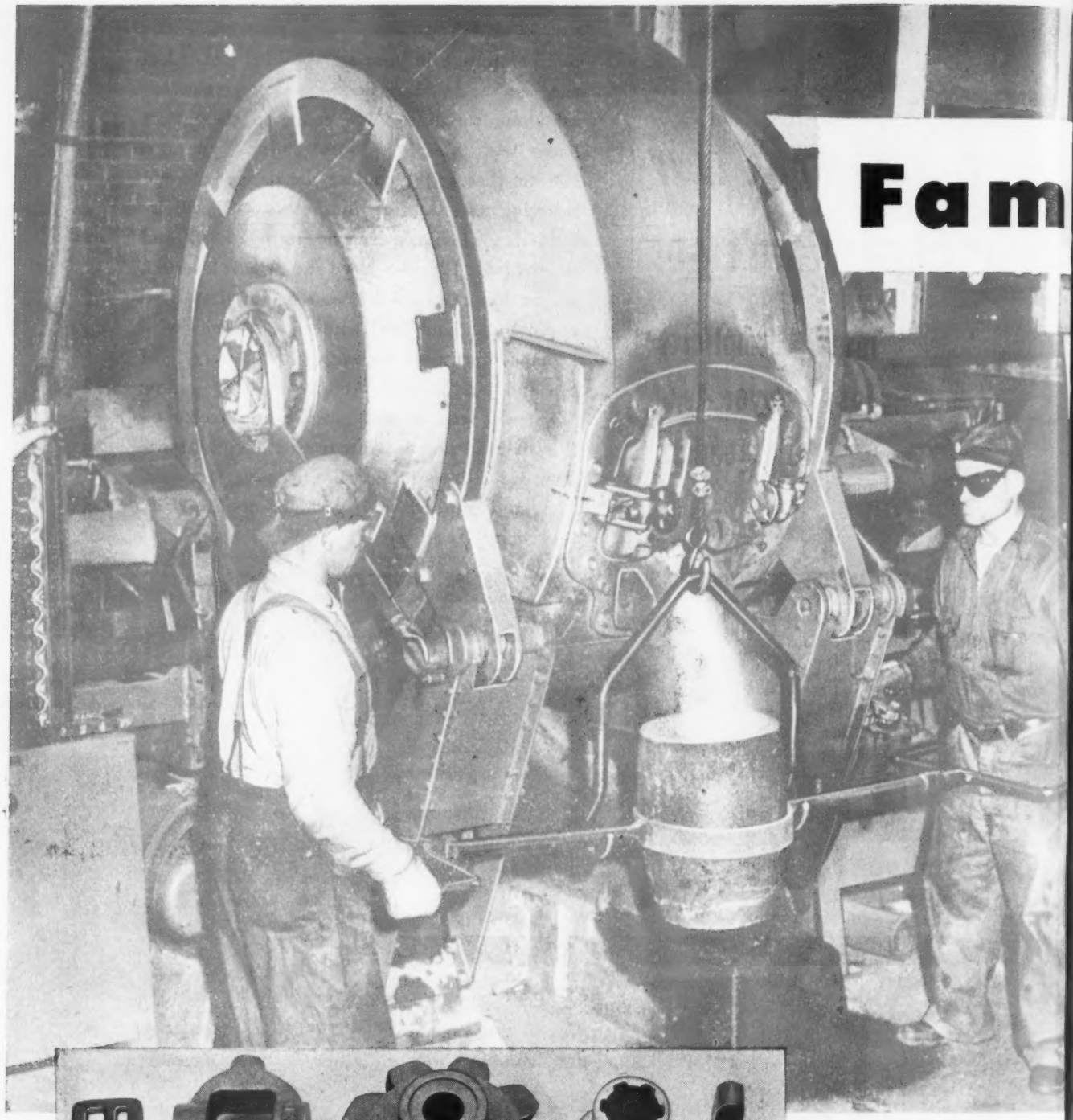
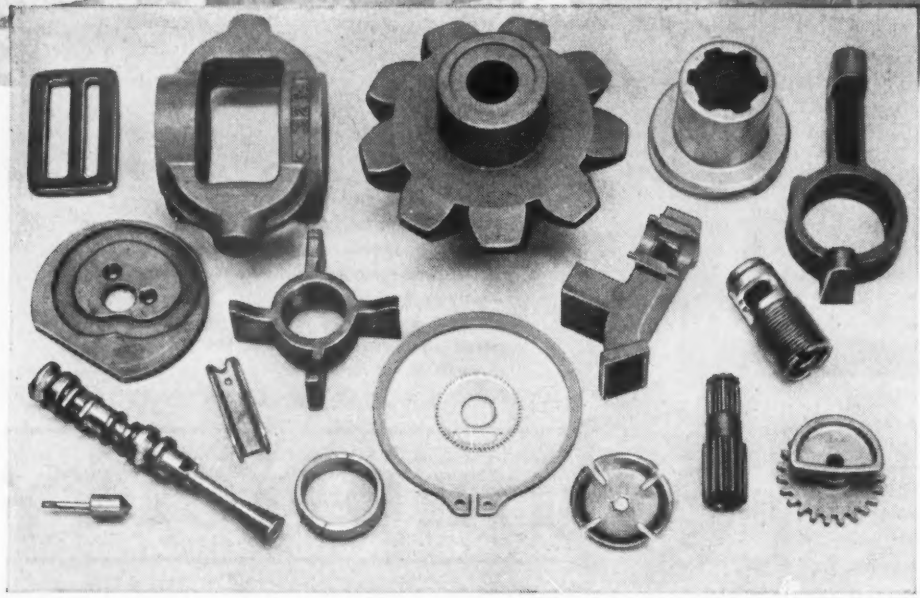
- **Sales Representatives In All Parts Of The U.S.A.**
- **For Canada:** Canadian Bridge Engineering Company, Ltd., Walkerville, Ontario
- **For Export:** Brown & Sites, 50 Church Street, New York 7, N. Y.

Simplicity
TRADE MARK REGISTERED

ENGINEERING CO. • DURAND, MICHIGAN





▲ Tapping a heat of beryllium copper from one of five Detroit Electric Furnaces at The Beryllium Corp.

◀ Representative castings of beryllium copper, produced at The Beryllium Corporation.

ny of Eight!

The Beryllium Corporation melts all of its beryllium copper alloys in Detroit ROCKING electric furnaces

Beryllium copper alloys, produced by The Beryllium Corporation, are gaining an expanding place in industrial usage because of their special combinations of useful properties. All eight alloys in Beryllium Corporation's family are melted in Detroit Rocking Electric Furnaces.

Accurate Control

Accurate temperature control is one of the important advantages these furnaces deliver. Through melt after melt, the desired melting cycle is followed, resulting in fastest, most efficient operation.

The rocking action of the furnace during the melt always assures homogeneity. Minimum metal loss allows a high degree of control over alloy composition.

Metal for castings is poured directly from the furnace into pig molds of various sizes. Detroit Rocking Electric Furnaces are also used for producing ingots, too.

Favorites in many Foundries

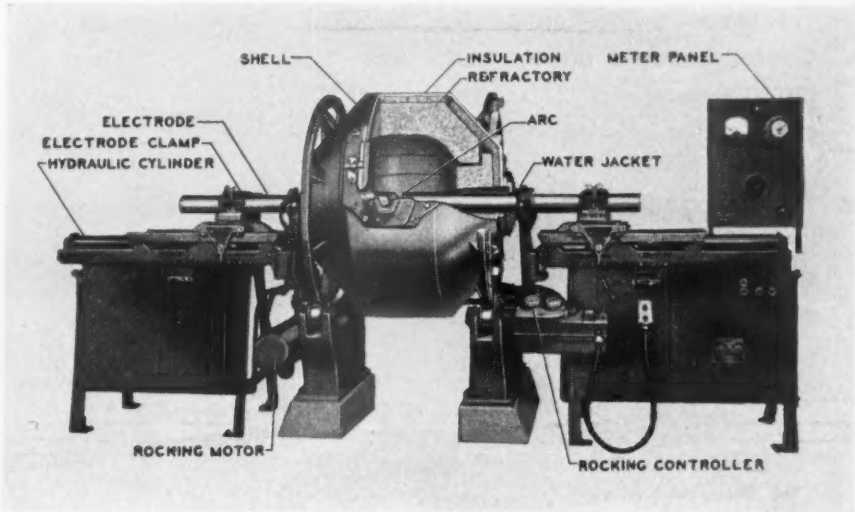
The same qualities which make them so efficient at Beryllium Corporation work as well at hundreds of foundries throughout the world.

Positive control of composition and quality, reduced metal shrinkage, more efficient use of power, no carbon pick-up because electrodes remain clear of the molten metal, more heats per day, higher quality castings, fewer rejected castings, more usable metal per melt, less out-of-production time because of easy shell replacement—these are some of the advantages Detroit Electric Furnaces offer in ferrous and non-ferrous melting.

Furnaces (10 to 4000 lbs. capacity) are individually designed to meet your plant electrical specifications.

Write for Facts

Send us your production data. Ask for facts on high operating economy, quality control and other advantages for *you* in Detroit Rocking Electric Furnaces!



ELECTRIC FURNACE DIVISION

Kuhlman Electric Company • Bay City, Michigan

CUT GATES AND RISERS

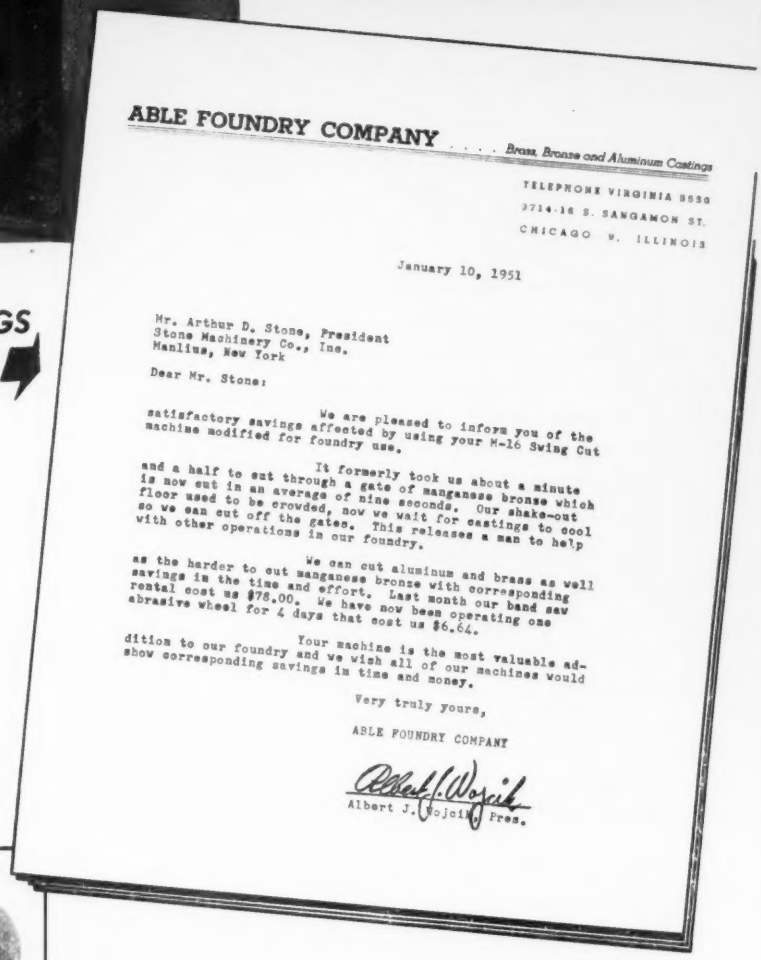
on non-ferrous metals

10 Times Faster

with a

STONE "Swing-Cut"

Type M-16 ABRASIVE CUT-OFF MACHINE



ABLE FOUNDRY COMPANY . . . . *Brass, Bronze and Aluminum Castings*

TELEPHONE VIRGINIA 8550
3714-16 S. SANGAMON ST.
CHICAGO 9, ILLINOIS

January 10, 1951

Mr. Arthur D. Stone, President
Stone Machinery Co., Inc.
Manlius, New York

Dear Mr. Stone:

We are pleased to inform you of the satisfactory savings affected by using your M-16 Swing Cut machine modified for foundry use.

It formerly took us about a minute and a half to cut through a gate of manganese bronze which is now cut in an average of nine seconds. Our shake-out floor used to be crowded, now we wait for castings to cool so we can cut off the gates. This releases a man to help with other operations in our foundry.

We can cut aluminum and brass as well as the harder to cut manganese bronze with corresponding savings in the time and effort. Last month our band saw rental cost us $75.00. We have now been operating one abrasive wheel for 4 days that cost us $6.64.

Your machine is the most valuable addition to our foundry and we wish all of our machines would show corresponding savings in time and money.

Very truly yours,

ABLE FOUNDRY COMPANY

Albert J. Wojcik

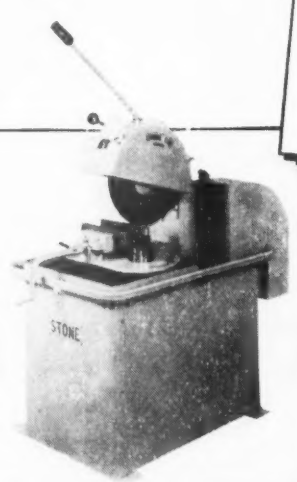
Albert J. Wojcik, Pres.

YOU CAN REALIZE THESE SAVINGS — IN YOUR FOUNDRY

The Stone "Swing-Cut" M-16 is priced several hundred dollars below comparable machines. This is the ideal machine for all size foundries.

- **We'll be glad to show you how to cut costs in your foundry. Write today!**

The Stone machine can be converted in five minutes to a cut-off machine for quick, low-cost cutting of rods, tubes, pipes, bars, structurals.



STONE MACHINERY CO., INC.

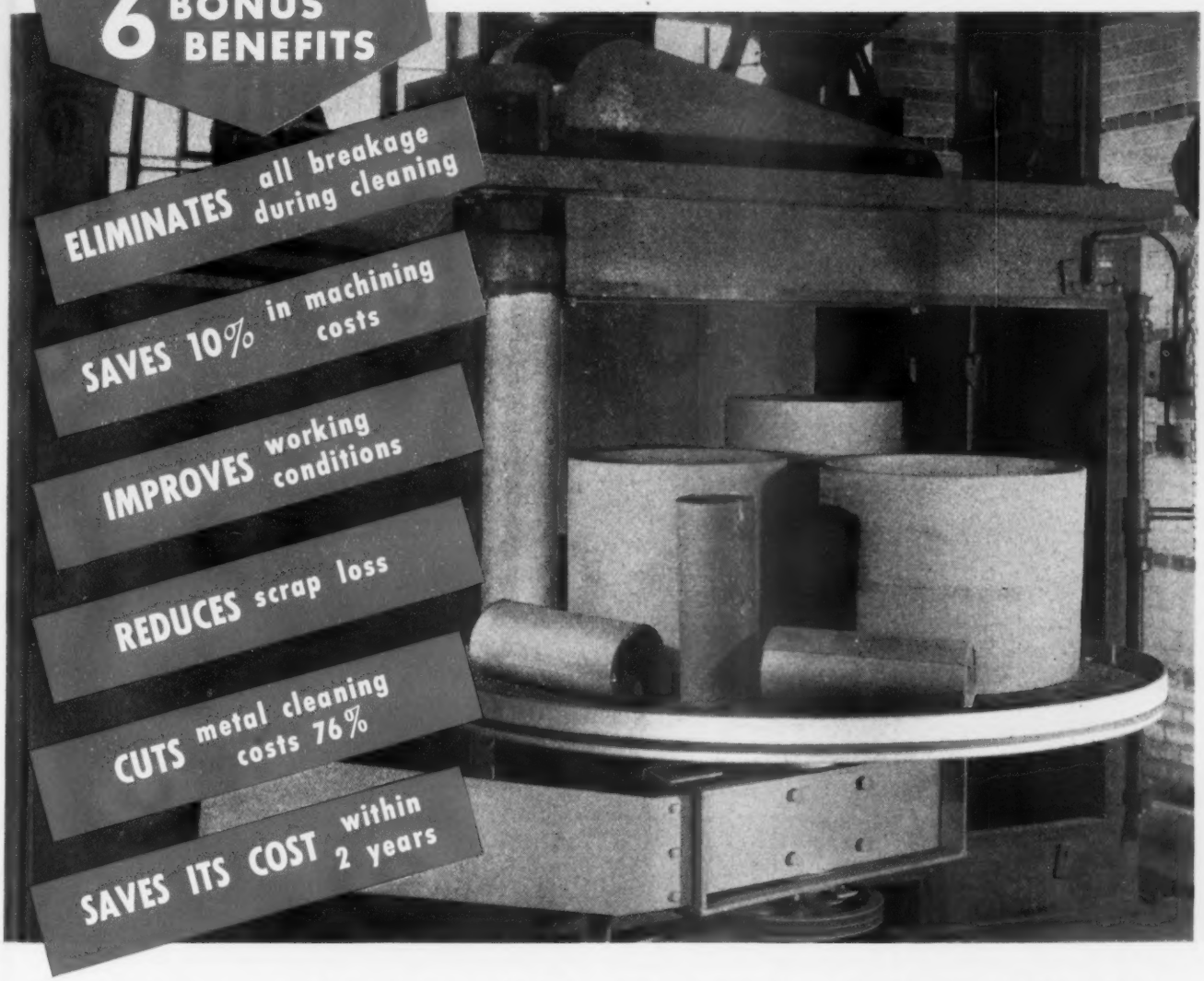
320 Fayette St. Manlius, N.Y.

WHEELABRATOR®

AIRLESS BLAST CLEANING

cleans 66% more work with ½ the labor

at TORONTO FOUNDRY CO., LTD.


and provides
6 BONUS BENEFITS
ELIMINATES all breakage during cleaning
SAVES 10% in machining costs
IMPROVES working conditions
REDUCES scrap loss
CUTS metal cleaning costs 76%
SAVES ITS COST within 2 years

Metal cleaning costs have hit a new low at the Toronto Foundry Company Ltd. Using a Wheelabrator Swing Table they now clean twenty tons of castings at the cost of 6 tons by former methods. The Swing Table replaced four tumbing mills and cut manpower requirements in half.

The high-speed blast cleaning of the Wheelabrator Swing Table removes sand so thoroughly that 10% less machining is required. It also has permitted the use of carboloy tools. All breakage has been eliminated and scrap losses have been considerably reduced. There has been a decided improvement in working conditions through elimination of noise and dust from the cleaning room. The net result is direct cash savings which will pay for the equipment within two years. Can you use a big saving? Let American Engineers show you how "Wheelabrator" can cut your cleaning costs and give your profits a boost.

Send for catalog No. 74-B. It gives complete information on all phases of blast cleaning.

American

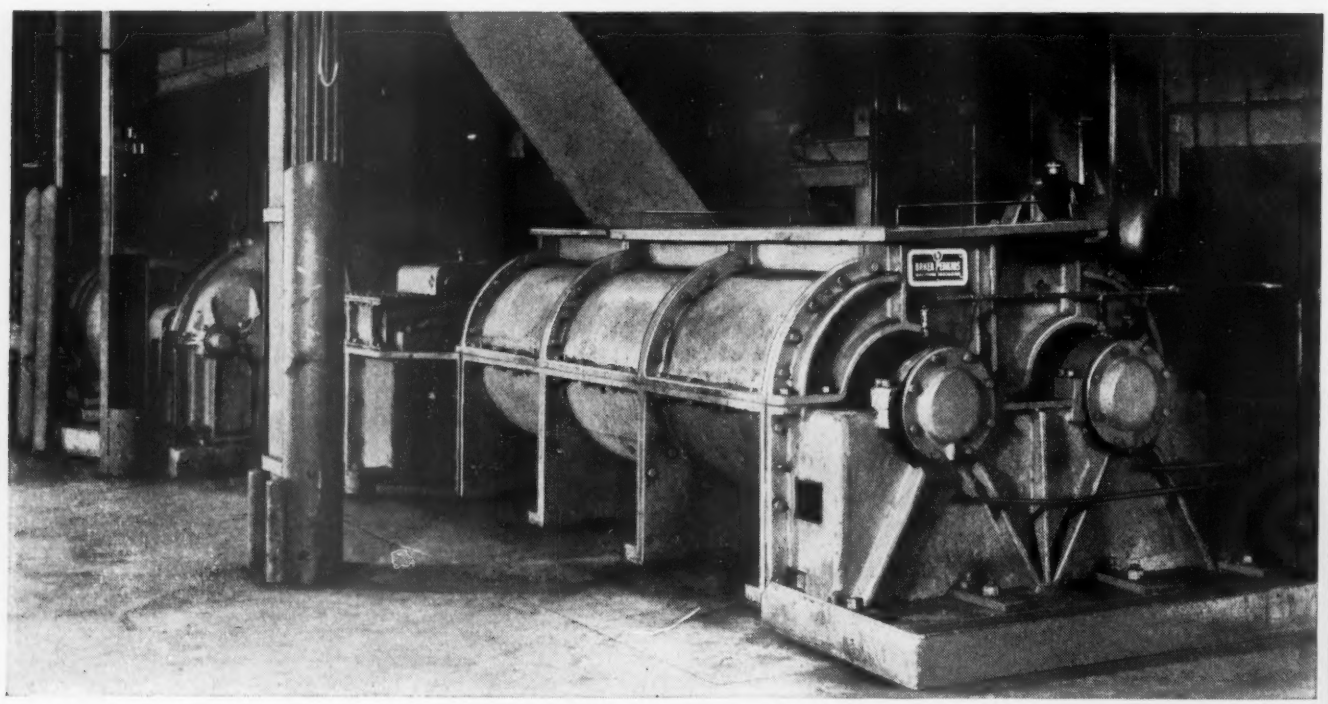
WHEELABRATOR & EQUIPMENT CORPORATION
505 S. Byrkit St., Mishawaka 2, Indiana

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

17,280 TONS

OF MOLDING SAND PER 3-SHIFT DAY

processed by Baker Perkins mullers in world's biggest grey iron foundry

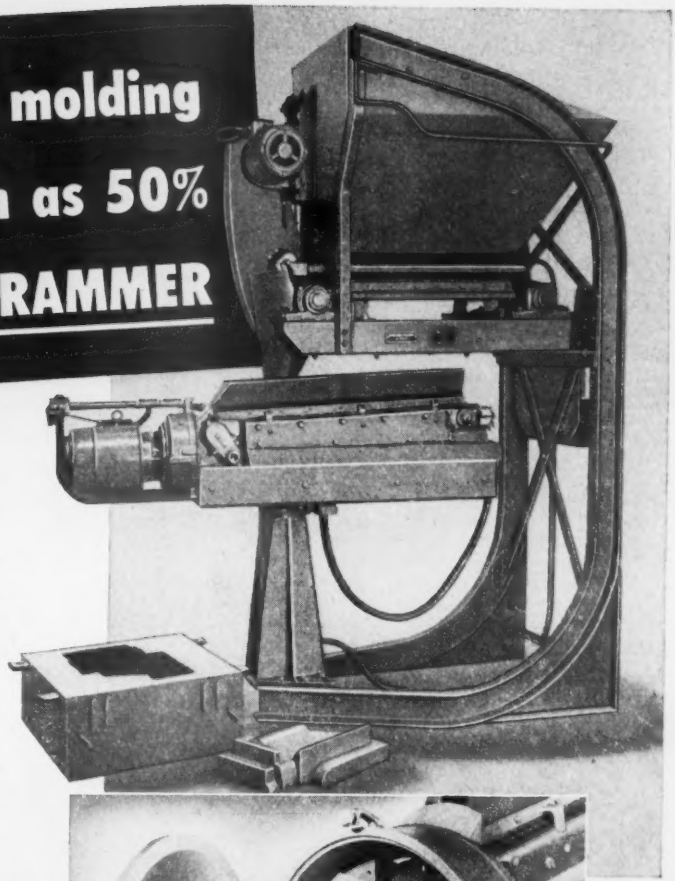


Six Baker Perkins Continuous Mullers are on the job at the world's biggest grey iron foundry helping to meet tough, tight schedules that depend on high daily production. Each B-P 5A Muller is conditioning 120 tons of molding sand each hour during an 8-hour shift. In the course of a 3-shift day, the six B-P Mullers handle the staggering total of 17,280 tons of sand that comes to the molding lines thoroughly mixed and tempered. Baker Perkins Continuous Mixers are ideal for processing molding sand on a big scale. Unique blade arrangement in B-P Mullers thoroughly mulls and aerates the tumbling sand mass, and each grain of sand is correctly coated with bond. B-P Mullers will deliver an uninterrupted flow of 30 to 120 tons of good sand per hour depending upon the size unit. Baker Perkins Continuous Mullers produce improved sands that mean better castings and lower scrap loss. They dependably meet the demands of high production automotive foundries and they can do the same for you. Write, wire, or phone for the full story on Baker Perkins Continuous Mullers.

BAKER PERKINS INC.

SAGINAW, MICHIGAN

TABOR SAYS...Reduce molding costs by as much as 50% with "JUNIOR" SANDRAMMER



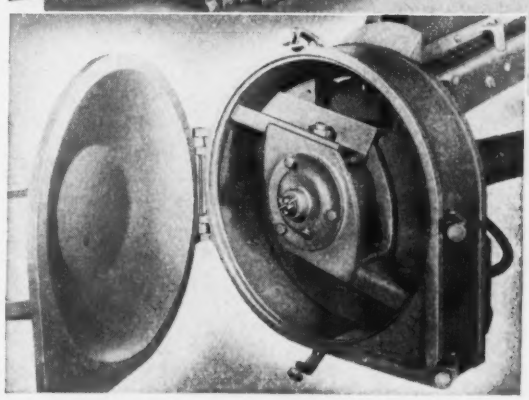
GREATER RAMMING SPEED AND FLEXIBILITY are the reasons behind "Junior's" ability to cut costs.

SPEED—The new-type Impellor Head rams molds at a phenomenal rate. Trolleys and swivels are finely balanced, ball-bearing mounted for ease of operation. Simple, sequence, push-button controls are at the operator's finger tips.

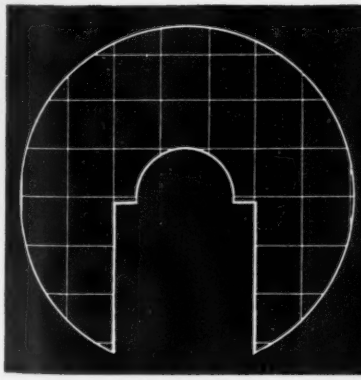
FLEXIBILITY—"Junior" quickly pays for itself in core room or on small jobbing floor. Ideal for ramming up molds from loose patterns, for short-run core making, and for handling light to medium production work in both core room and foundry. Can be moved by crane from area to area, or mounted on rail-car for along-track ramming. Adaptable to hand, hoist, or over-head system sand feeding.

PLUS—Low original cost, long trouble-free life, low operating and maintenance costs.

Summed up, "Junior" Sandrammer is a machine you can keep at work *all day, every day.* That means sound investment—quick pay-off.



Adjustable, multi-blade impellors give greater ramming speed and five-fold life. Simple blade adjustment compensates for wear and controls density of mold. Rams mold with equal density throughout whole area and depth.



The blocked portion of this diagram shows working floor area covered by ramming head of "Junior" Sandrammer. Since each block represents one square foot, this sketch quickly tells you the combined maximum lengths and widths of molds which the "Junior" can handle.

"JUNIOR" SPECIFICATIONS

Height from floor to top of hopper	8'- 8¾"
Height from floor to sand discharge point	2'-10½"
Max. height of flask	2'- 9½"
Hopper capacity	675 lbs.
Sand throwing capacity	Up to 150 lbs. per minute

Write, wire or 'phone.
A Tabor engineer will be ready to team up with you.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

The TABOR Manufacturing Co.

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

Tabor Manufacturing Co. is licensed to manufacture and sell Sandrammers by Foundry Equipment, Ltd., Leighton Buzzard, Bedfordshire, England.

Tell us what type of SAND *you're using*

...and we'll advise you which

CORE OIL

to use for *better cores!*

Skill and care are not the only combination it takes to make cores that result in sound, accurate castings. It also takes the *right sand and oil combination.* Houghton research has developed data showing how varying sands work best with certain types of core oils. What sand do *you* use? One of Houghton's cost-cutting core oils will team up with it perfectly!

Probably the outstanding qualities of Houghton's Hy-Ten Core Oils are their rigidly controlled uniformity and high tensile strength regardless of baking temperature. These are also the qualities most vital to *you.* Constant research made it possible for us to put these advantages into core oils that also possess many more. Hy-Ten oils perform better in the core box without sticking. They give you a strong green bond with good shake-out ability. And core gas is no problem at all.

We believe the Houghton man can help your core makers produce better work with fewer rejects. Why not turn your core problems over to him for proof right in your own foundry? Write E. F. Houghton & Co., Philadelphia 33, Pa.

WRITE FOR BULLETIN

. . . and don't hesitate to ask the Houghton man for help with your core making problems. He's there to serve you.

HY-TEN
. . . a product of

E. F. HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

HOW TO GET MORE PIECES PER TON!

From a given quota of metal, you can now cast more parts, and reduce scrap piles. You can do this by using the "C" process for producing *thin-shell* sand molds and cores that turn out castings to extremely close dimensions.

Such castings conserve metal by greatly reducing the amount of machining required, often just a finish cut being needed. They conserve metal by minimizing rejects. Whether you cast ferrous or non-ferrous metals, these thin-shell molds and cores will cut down scrap piles—and pile up greater profits instead.

For besides conserving metal, shell molds require only 10 per cent of the sand normally needed for conventional molds. You get virtually pattern-smooth molds and cores in record time. And because of their dimensional stability and high moisture resistance, these molds can be stored for long periods, promoting efficiency by letting you build up mold inventories to match anticipated quotas of metal and demands for production.

Bakelite's laboratories have developed special BAKELITE Phenolic Bonding Resins for the rapid heat-setting of shell molds and cores. They have also formulated a special wetting agent that minimizes segregation in the resin-sand mixture. Available as well is a superior parting agent that facilitates release of the molds and cores from the hot patterns.

Why not investigate fully this time-saving, economical method of conserving metal. Write Dept. BS-29 for helpful information.

BAKELITE
TRADE-MARK
PHENOLIC
BONDING RESINS
TRADE B MARK

BAKELITE DIVISION
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N.Y.

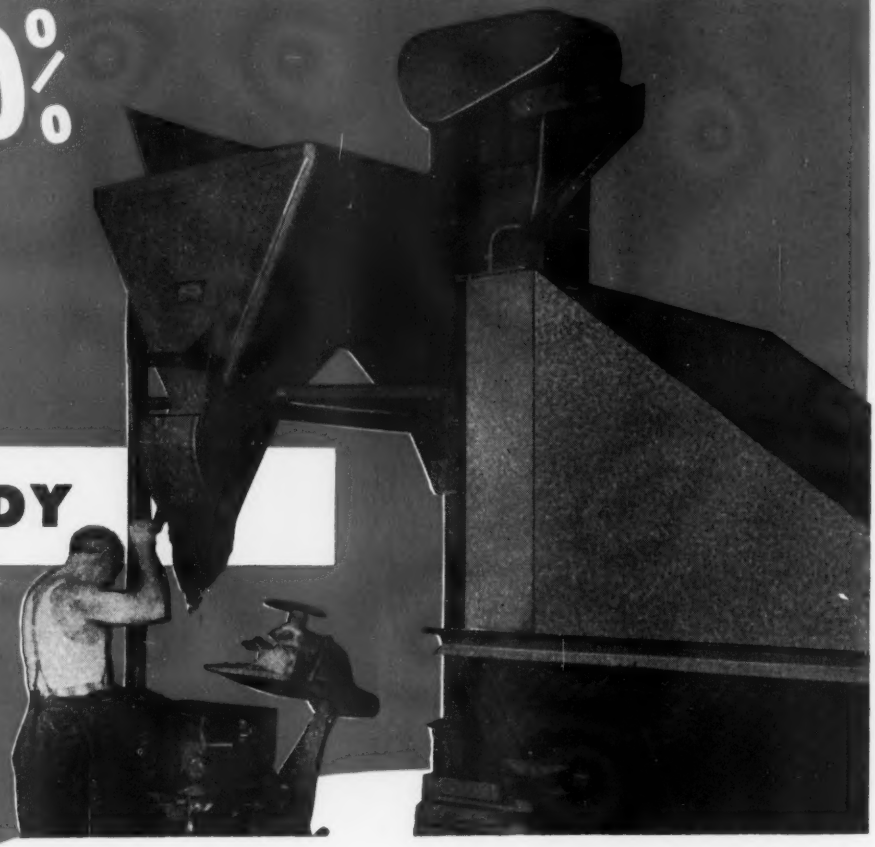
20% to 50%

production increase with first

HANDY SANDY

brings repeat order

from Attwood Brass Works
Grand Rapids, Michigan



The Handy Sandy has proved that it cuts foundry costs and increases molders' production by eliminating hand shoveling for molders. The savings it makes have been demonstrated by foundrymen in their own plants . . . who now are sending in repeat orders because of these savings.

One of these repeat users is the Attwood Brass Works where use of the Handy Sandy has increased the output of molders from 20% to 50% depending upon the job. Complete records, kept by Attwood since the Handy Sandys were installed show that 2 molders now produce as much as 3 did when filling the flasks by hand shoveling.

Mr. C. H. Attwood says "The Handy Sandy is an outstanding method of low-cost mechanization which helps the small foundry keep pace in this highly mechanized age. It has made the molders' job easier and has helped labor relations. It has improved the quality of castings because of the finer texture of the sand."

Yes, the Handy Sandy takes the shovel out of the molder's hand and lets him devote full time to molding. It puts the sand overhead to eliminate "shovel-fatigue." He just pulls a lever or operates an air valve and the sand drops into the flask. It's as simple as that.

It's easy, too, to see that Handy Sandy is doing a real cost-cutting job. The partial list of repeat users below testifies to this. Make a date to see a Handy Sandy in operation. Airmail your request today for prices, free bulletins and free list of users.

these firms have reordered after HANDY SANDY proved itself in their plant

	Times reordered
ANDERSON BRASS WORKS, Birmingham, Alabama	2
CAPITAL BRASS & ALUMINUM FDRY. CO., Chicago, Ill.	1
ELKHART BRASS MFG. CO., Elkhart, Indiana	1
MICHIGAN WHEEL CO., Grand Rapids, Mich.	1
CHEMUNG FOUNDRY CO., Elmira, New York	1
HAMILTON BRASS & ALUM. CASTGS. CO., Hamilton, Ohio	2
F. E. MYERS & BROS. CO., Ashland, Ohio	1

NEWAYGO | ENGINEERING COMPANY

NEWAYGO, MICHIGAN

Manufacturers of Neway Mold Handling, Sand Handling and Conditioning Equipment.

FOUNDRY News Report

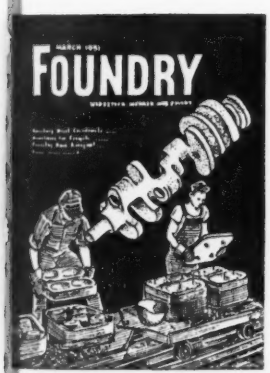
Feb. 22, 1951

CASTING PRICES: New regulations covering maximum prices for castings likely will be issued at Washington. Foundries theoretically are covered by the General Ceiling Price Regulation made effective Jan. 26 by the Economic Stabilization Agency. This regulation specifies that ceiling prices for all sellers are the highest prices at which a commodity was delivered or quoted for sale during the base period—Dec. 19, 1950, to Jan. 25, 1951. However, OPS and foundry officials agree new regulations are needed for castings, because the general order does not provide for the formula type of pricing. The formula method calculates prices on the basis of direct labor and material costs, overhead and profit.

CMP DUE JULY 1: A new Controlled Materials Plan probably will start with the second half. It will replace the DO system, which hardly could be expected to stand up under the load of expanding requirements. Patterned after the successful CMP of the last war, the plan would provide for various government claimant agencies to indicate their requirements of steel, copper and aluminum for defense and essential civilian purposes. Balance of the supply would be available for other civilian uses.

GRAY IRON RECORD: More gray iron castings were shipped in 1950 than in any previous year. Latest Bureau of the Census report shows a 1950 total of 12,905,562 tons, 22 per cent ahead of 1949. Despite a relatively slow first quarter, last year closed fast to just top the previous record of 12,785,909 tons established in 1948.

PIG IRON: Production of pig iron also hit a new peak last year. Output of 64,589,140 tons exceeded the 1949 total by nearly 21 per cent, according to the American Iron and Steel Institute. More pig iron went to users outside the steel industry—principally to foundries—than ever before—5,692,000 tons. This bettered the 1949 total by more than 1.3 million tons and that of 1948 by more than 400,000 tons.



THE COVER: Assembling the molds for cast steel crankshafts at the St. Joseph, Mich., foundry of the Auto Specialties Mfg. Co.
See page 84

BUSY YEAR: Shipments of all types of castings in 1950 approximated 16 million tons, only slightly below the 1948 record. Ferrous metals accounted for about 95 per cent of the total. Foundry activity has more than kept pace with industrial operations as a whole since World War II. For instance, casting shipments in 1950 were 22 per cent larger than in 1946, the first full postwar year, while the industrial production index of the Federal Reserve Board showed an increase of 18 per cent.

SCRAP PRICES: Ceiling prices on iron and steel scrap were established by the Office of Price Stabilization, effective Feb. 7. These quotations represent substantial rollbacks from previous levels in certain instances. Ceilings for steelmaking and blast furnace grades of scrap are given in the new regulation as delivered prices for leading basing points of the steel industry. Uniform prices apply throughout the country for the various grades of cast iron scrap; however, these prices are f.o.b. shipping point. No. 1 cupola cast under this schedule is $49 a gross ton.

MORE SCRAP NEEDED: What effect ceiling prices will have on ferrous scrap supply remains to be seen. Mills and foundries are expected to require 3 million more tons this year than last. To round up this tonnage the Iron and Steel Scrap Industry Advisory Committee has recommended to NPA: Acceleration in scrapping obsolete ships; release by government and industry of all obsolete equipment and machinery; increased importation of scrap; recovery of ferrous metals from slag dumps, and organized salvage drives within industry.

RATED ORDERS: NPA again has increased the percentage of supplies of certain steel products that must be reserved for DO-rated orders. This does not affect castings, however. Under the Jan. 22 amendment to order M-1, producers of gray iron (excluding pipe and fittings), malleable iron, and carbon and low alloy castings are not required to accept rated orders for shipment in

any one month in excess of 20 per cent of their average monthly shipments the first eight months last year. Foundries also need not accept a rated order received less than 60 days prior to the first day of the month in which shipment is requested.

MRO ORDER: Return of an MRO (maintenance, repair and operating) order similar to that of World War II days is in prospect. This order will entitle all companies to obtain the various parts, supplies, etc., it needs to keep its plant in operating repair—but not materials that enter into manufacturing. A limit will be placed on the amount of items obtainable under the special rating to be issued for the purpose.

WITH NPA: Chief of the Foundry Equipment and Supply Section of the NPA Machinery Division will be Aubrey J. Grindle, recently vice president of the Whiting Corp., it is reported. It is also understood that Thomas Kaveny Jr., president, Herman Pneumatic Machine Co., will serve the section as a part-time consultant. William W. Alston has joined the Ferroalloys Section of the NPA Iron and Steel Division, working on allocations of ferroalloys. Recently with Alloy Engineering & Casting Co., Champaign, Ill., he previously had been with Duriron Co., Dayton, O., and American Steel Foundries.

ALLOY SUPPLY: Here's the supply picture of critical alloys: Colbalt—virtually the entire supply is allocated to defense and essential civilian work. Columbium—98 per cent is going into defense needs. Nickel—less available per ton of steel produced than in 1943-45. End-use limitation and allocation necessary. Molybdenum—stocks frozen by NPA and end-use limitation and allocation planned. Tungsten—end-use limitation and allocation starts Mar. 1. Chromium—tight, but more capacity going into production. Manganese and Silicon—supplies seen adequate.

SMALL BUSINESS MOVES: ECA has moved its Office of Small Business to the LaSalle Building, 1728 L St., N. W., Washington 25. Telephone number is Sterling 6400, extensions 3135-6-7-8.

PRICES OF FOUNDRY METALS AND COKE

(As of Feb. 22, 1951)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$17.00-18.00
New River	19.50
Wise County	15.95
OVEN	
Birmingham	$20.30
Chicago	21.00
Detroit	24.00
Erie, Pa.	23.50
Everett, Mass.	24.80
Indianapolis	22.75
Kearney, N. J.	22.75
Milwaukee	23.75
Painesville, O.	24.00
Philadelphia	22.70
Pittsburgh	23.00
Portsmouth, O.	21.50
St. Louis	24.25
Swedeland, Pa.	22.00
Terre Haute, Ind.	22.50

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$54.50	$55.00
Birmingham	48.88	....
Buffalo	52.50	53.00
Chicago	52.50	52.50
Cleveland	52.50	52.50
Everett, Mass.	53.25	53.75
Fontana, Calif.	58.50	....
Geneva, Utah	52.50	....
Granite City, Ill.	54.40	54.90
Lone Star, Tex.	48.50	48.50
Pittsburgh	52.50	52.50
Steelton, Pa.	54.50	55.00
Swedeland, Pa.	56.50	57.00
Toledo, O.	52.50	52.50
Troy, N. Y.	54.50	55.00
Youngstown, O.	52.50	52.50

NONFERROUS INGOTS

BRASS AND BRONZE: 85-5-5-5—29.00c; 88-10-2—43.25c; 80-10-10—35.00c; No. 1 yellow—25.00c. **ALUMINUM:** 99 per cent plus, primary ingots 19.00c. Secondary No. 12 alloy 29.50-30.25c. **MAGNESIUM:** 99.8 per cent standard ingots 24.50c, f.o.b. Freeport, Tex. **COPPER:** Electrolytic 24.50c, Connecticut valley; Lake 24.61½c, delivered. **ZINC:** High grade 18.60c, delivered.

IRON AND STEEL SCRAP

(Ceiling prices per gross ton as established by the Office of Price Stabilization)

	*No. 1 Heavy Melting Steel	**Steel, 2 ft & less	Punchings, Plate Scrap	Cast Iron Briquets
Birmingham	$39.00	$41.00	$41.50	$39.00
Buffalo	43.00	45.00	45.50	43.00
Chicago	42.50	44.50	45.00	42.50
Cincinnati	43.00	45.00	45.50	43.00
Cleveland	43.00	45.00	45.50	43.00
Detroit	40.00	42.00	42.50	40.00
Eastern Pa.	42.50	44.50	45.00	42.50
Los Angeles	35.00	37.00	37.50	35.00
Pittsburgh	44.00	46.00	46.50	44.00
San Francisco	35.00	37.00	37.50	35.00
St. Louis	41.00	43.00	43.50	41.00
Seattle	35.00	37.00	37.50	35.00

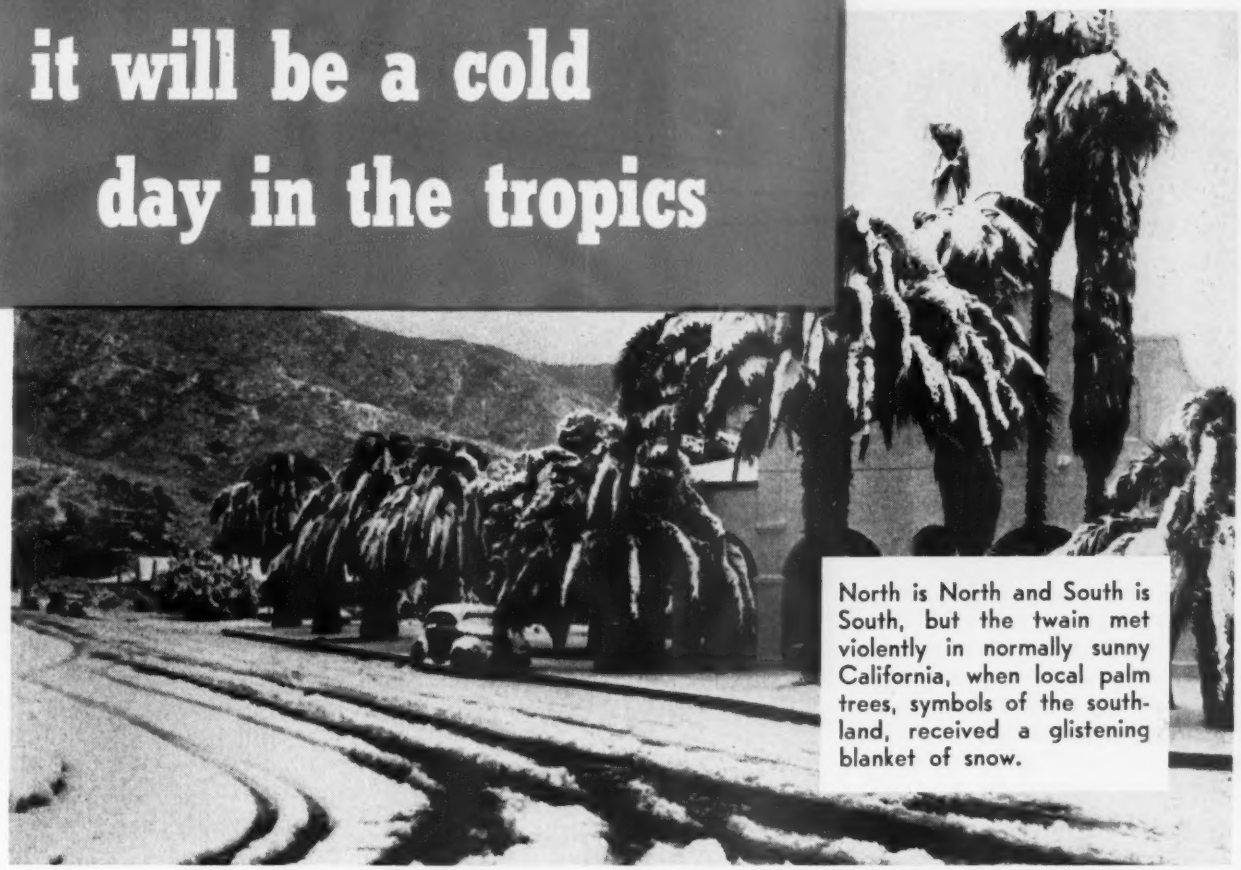
Above delivered prices are ceiling levels at basing points indicated. * Applies to dealer and industrial scrap; railroad heavy melting is $2 higher. ** Foundry steel 1 ft and under is $2 higher.

CAST IRON SCRAP

No. 1 cupola cast	$49.00
Heavy breakable cast	45.00
Burnt cast iron	41.00
Cast iron brake shoes	41.00
Stove plate	46.00
Clean auto cast	52.00
Unstripped motor blocks	43.00
Iron wheels, No. 1	47.00
Malleable	55.00
Drop broken machinery cast	52.00

Above ceiling prices, per gross ton, are f.o.b. shipping point. Add transportation charges to obtain delivered prices at any foundry.

it will be a cold day in the tropics



North is North and South is South, but the twain met violently in normally sunny California, when local palm trees, symbols of the southland, received a glistening blanket of snow.

—when we succeed in pleasing everybody all the time. But that doesn't keep us from trying. We believe in the old-fashioned principle of being friendly and helpful whether we are in a "buyers" or a "sellers" market.

FERRO-SILICON 25 - 50 - 65 - 75 - 85 - 90%
SPECIAL BLOCKING 50% FERRO-SILICON
LOW CARBON FERRO-CHROME SILICON
HIGH CARBON FERRO-CHROME
FERRO-MANGANESE • BOROSIL • SIMANAL

BRIQUETS

SILICON • MANGANESE • CHROME
SILICO - MANGANESE

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Ohio Ferro-Alloys Corporation
Canton, Ohio

Chicago Detroit Pittsburgh Tacoma Seattle
Minneapolis Birmingham San Francisco Los Angeles

SALES AGENTS AND WAREHOUSES:

SAN FRANCISCO AREA—Pacific Graphite Company, Inc., Oakland 8, California.

LOS ANGELES AREA—Snyder Foundry Supply Company, Los Angeles 11, California.

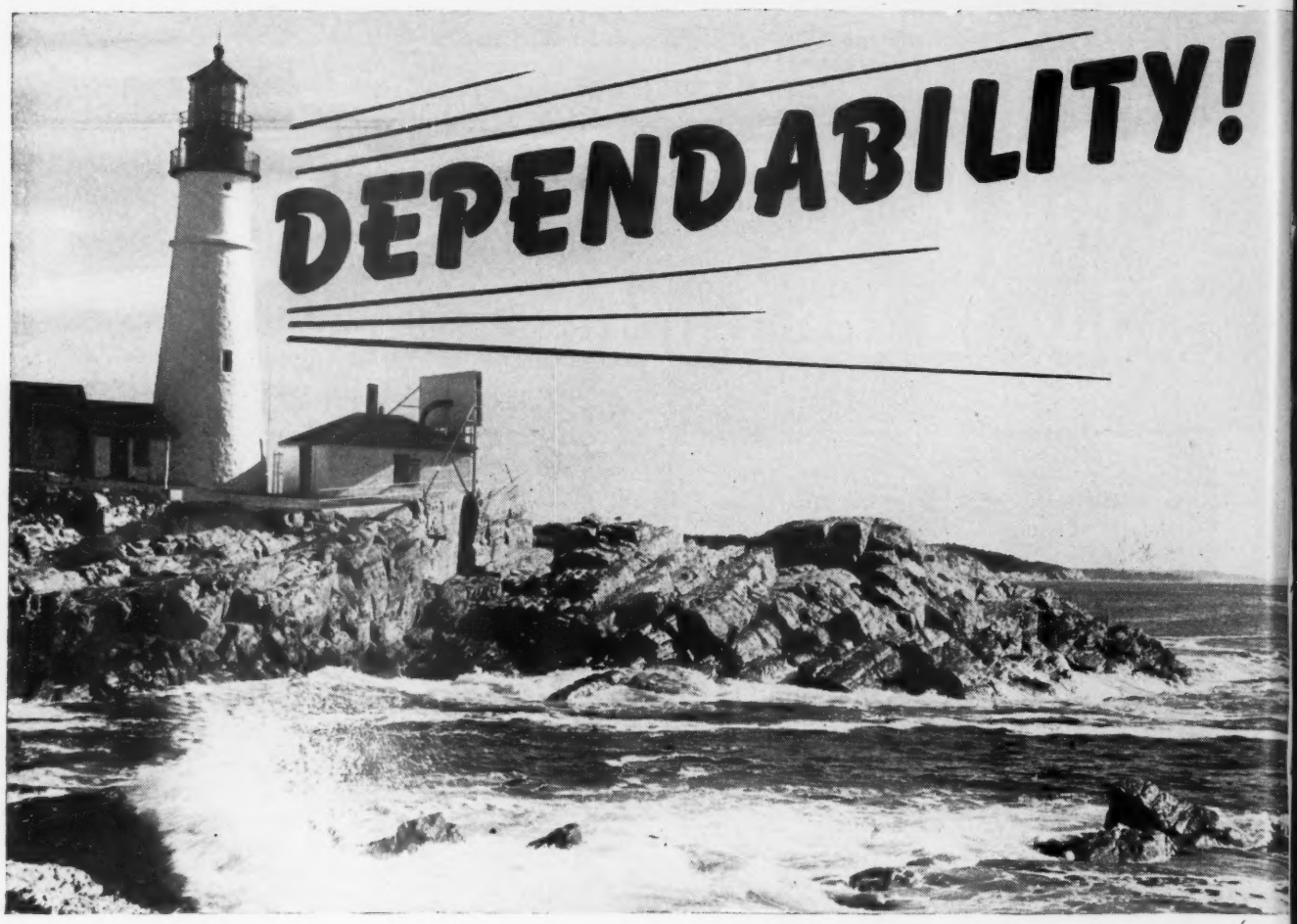
MINNEAPOLIS AREA — Foundry Supply Company, Minneapolis, Minnesota.

MEXICO—Casco S. de R. L., Apartado Postal 1030, Calle Atenas 32-13, Mexico, D. F., Mexico.

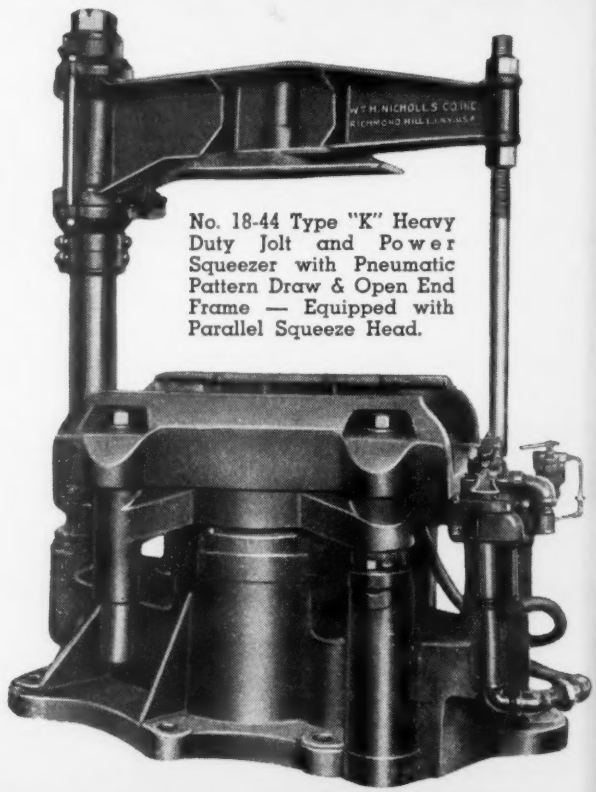
SALES AGENTS, NO WAREHOUSES:

NORTHWEST AREA—E. A. Wilcox Company, Arctic Building, Seattle 4, Washington; Phone Mutual 1468.

BIRMINGHAM DISTRICT — Schuler Equipment Company, First National Building, Birmingham, Alabama.



● Nicholls Molding Machines give you DEPENDABILITY plus. You can DEPEND on these machines to withstand the pressure of constant use and to continually produce the maximum number of good molds. Nicholls Molding Machines place their DEPENDENCE on greater precision and power giving the best value at far lower costs. Nicholls has a complete line of stationary and portable types for the production of light, medium and heavy castings. Can be furnished with electric controls for push button operation.



No. 18-44 Type "K" Heavy Duty Jolt and Power Squeezer with Pneumatic Pattern Draw & Open End Frame — Equipped with Parallel Squeeze Head.

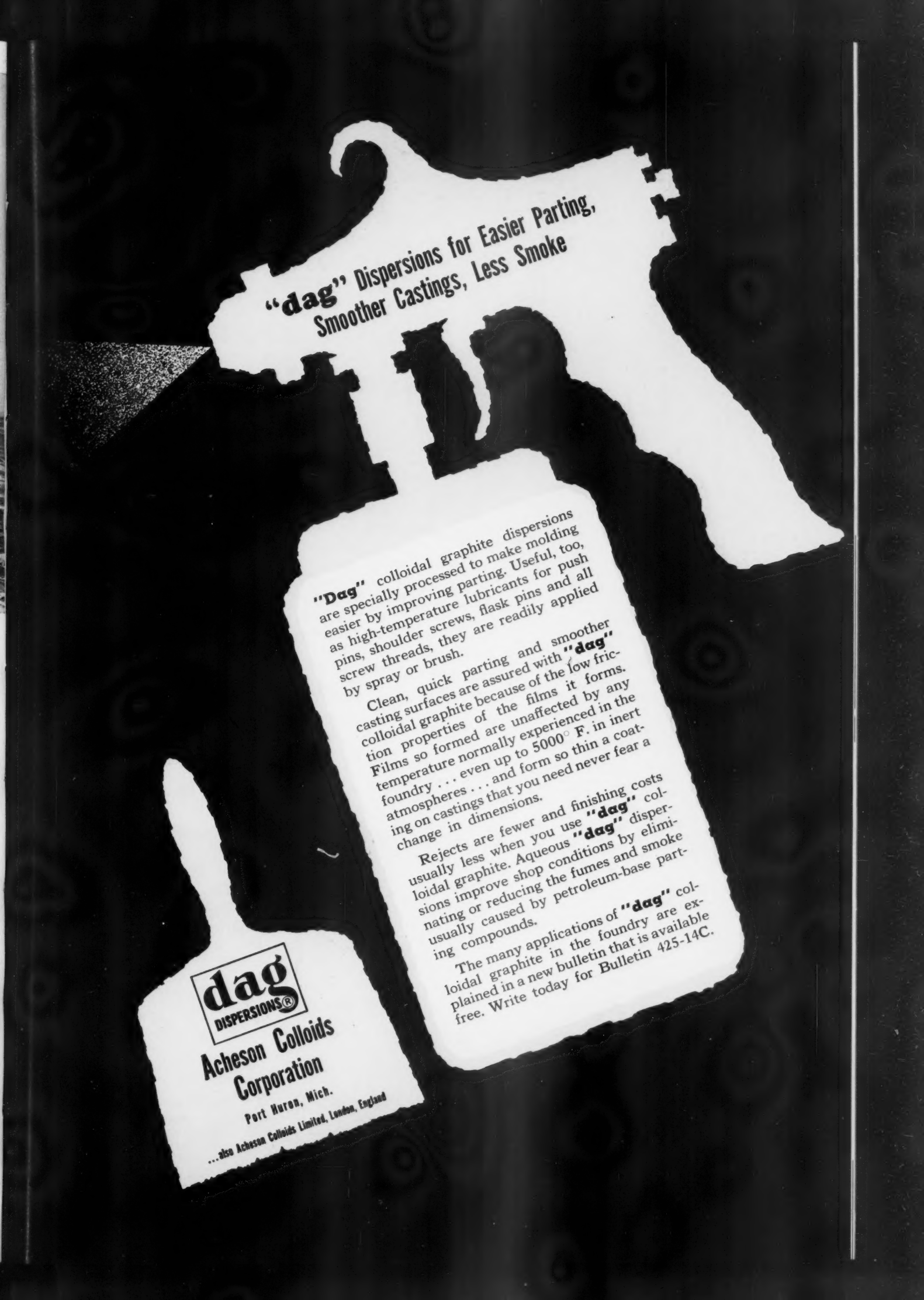
Wm. H. NICHOLLS Co., Inc.

RICHMOND HILL 18, LONG ISLAND, NEW YORK

ESTABLISHED 1910

Foreign Manufacturers and Selling Agents—For Continental Europe and Great Britain
George Fischer, Ltd., Schaffhausen, Switzerland

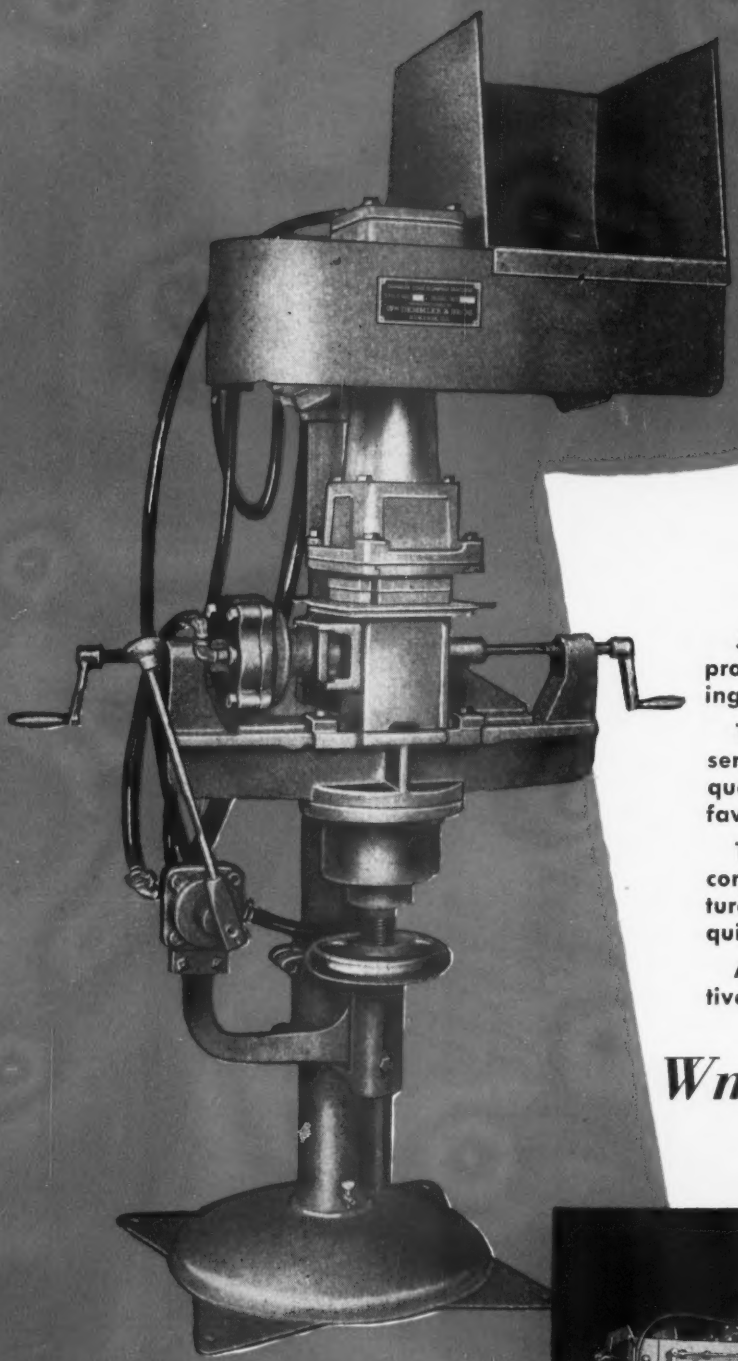
NICHOLLS


"dag" Dispersions for Easier Parting, Smoother Castings, Less Smoke
"Dag" colloidal graphite dispersions are specially processed to make molding easier by improving parting. Useful, too, as high-temperature lubricants for push pins, shoulder screws, flask pins and all screw threads, they are readily applied by spray or brush.
Clean, quick parting and smoother casting surfaces are assured with "dag" colloidal graphite because of the low friction properties of the films it forms. Films so formed are unaffected by any temperature normally experienced in the foundry . . . even up to 5000° F. in inert atmospheres . . . and form so thin a coating on castings that you need never fear a change in dimensions.
Rejects are fewer and finishing costs usually less when you use "dag" colloidal graphite. Aqueous "dag" dispersions improve shop conditions by eliminating or reducing the fumes and smoke usually caused by petroleum-base parting compounds.
The many applications of "dag" colloidal graphite in the foundry are explained in a new bulletin that is available free. Write today for Bulletin 425-14C.
dag DISPERSIONS®
Acheson Colloids Corporation
Port Huron, Mich.
...also Acheson Colloids Limited, London, England

Profits Multiply...

with

DEMMLER
CORE BLOWERS



DEMMLER
NO. 55

Join the thousands who are realizing greater profits through the use of DEMMLER core blowing machines.

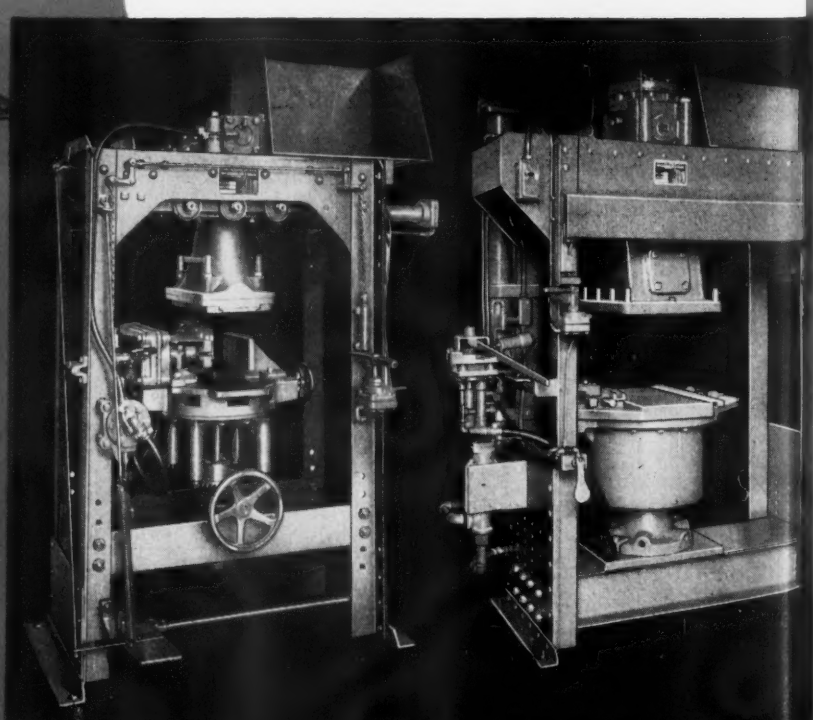
Their reputation for dependable, trouble-free service, coupled with their ability to produce high quality cores faster at less cost has made them a favorite everywhere.

There is a DEMMLER machine to meet every core blowing requirement. Each machine features both horizontal and vertical adjustments for quick, easy job changes.

A letter stating your needs will bring descriptive literature promptly. Write today!

Wm.* DEMMLER *& Bros.

Kewanee, Illinois



DEMMLER NO. 1

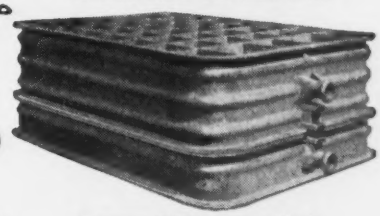
DEMMLER NO. 3E

TRUSCON
MARK OF MERIT PRODUCTS

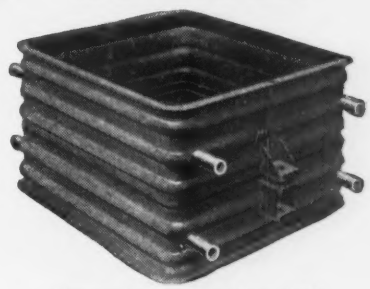
TRUSCON STEEL FOUNDRY FLASKS

Chase Father Time...

Truscon OM-1 One-Man Flask



Truscon CH-40 Crane Flask



Truscon TM-10 Two-Man Flask

with Truscon Steel Flask strength

The walls of every Truscon flask are built with great strength and rigidity to withstand severe strains. The ribs and flanges extend full depth around the entire flask without buckling or cutting away the metal. • The flanges and ribs of Truscon flasks are designed to help the molder. The flange on the filling side is turned out so it won't interfere with filling or shaking out. The flange on the bottom side or parting line is turned in, forming a sand strip to carry the sand. • Truscon flasks have available a range of handles and pin lugs to meet every particular need. *They are welded securely to withstand heavy strains.* • Every Truscon cope, drag and check is one integral piece of steel. Truscon flasks withstand the knocks and hard usage they are bound to get. • Write for catalog showing the wide range of Truscon Steel Flasks that can be manufactured.

TRUSCON STEEL COMPANY

PRESSED STEEL DIVISION
6202 Truscon Avenue, Cleveland 4, Ohio
Subsidiary of Republic Steel Corporation

for more castings of high

The need is critical for more, better quality, true-to-pattern castings.

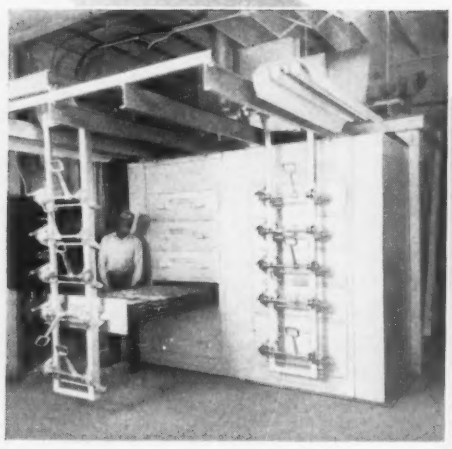
Coleman Core and Mold Ovens are vital in helping you meet this need better, faster and with less manpower.

Coleman Core and Mold Ovens produce perfectly baked cores, eliminate losses and delays caused by improper handling methods and inefficient oven equipment.

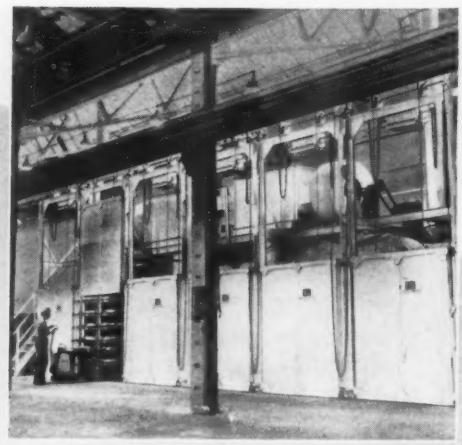
Coleman Mold Ovens for dry sand molding insure the proper drying needed to make castings always true-to-pattern. Coleman Ovens handle all types of molds uniformly and dependably, whether molds are to be skin dried or bone dried.

Today you are faced with acute labor shortages, high fuel costs, and scarcity of materials. That is why Coleman Ovens are more than ever essential to meet your requirements for increased production.

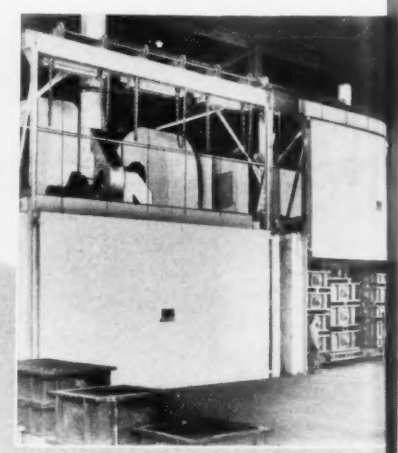
There is a type of Coleman Oven to help give you maximum production on every core baking or mold drying job. Write for Bulletin 48.



COLEMAN ROLLING DRAWER OVENS For small and medium cores. High-speed production with limited floor space.



COLEMAN TRANSRACK OVENS For use with portable racks to reduce handling labor. Very efficient where ample floor space is available.



COLEMAN CAR-TYPE OVENS For baki large cores or drying molds. Colem Car-Type Ovens are used by most the leading producers of heavy castin

A COMPLETE RANGE OF TYPES: COLEMAN OVENS are built in a complete range of sizes and capacities for every core-baking and mold drying requirement: Tower Ovens, Horizontal Conveyor Ovens, Car-Type Ovens, Transrack Ovens, Rolling Drawer Ovens, Portable Core Ovens, Portable Mold Dryers, etc.

THE FOUNDRY EQUIPMENT COMPANY

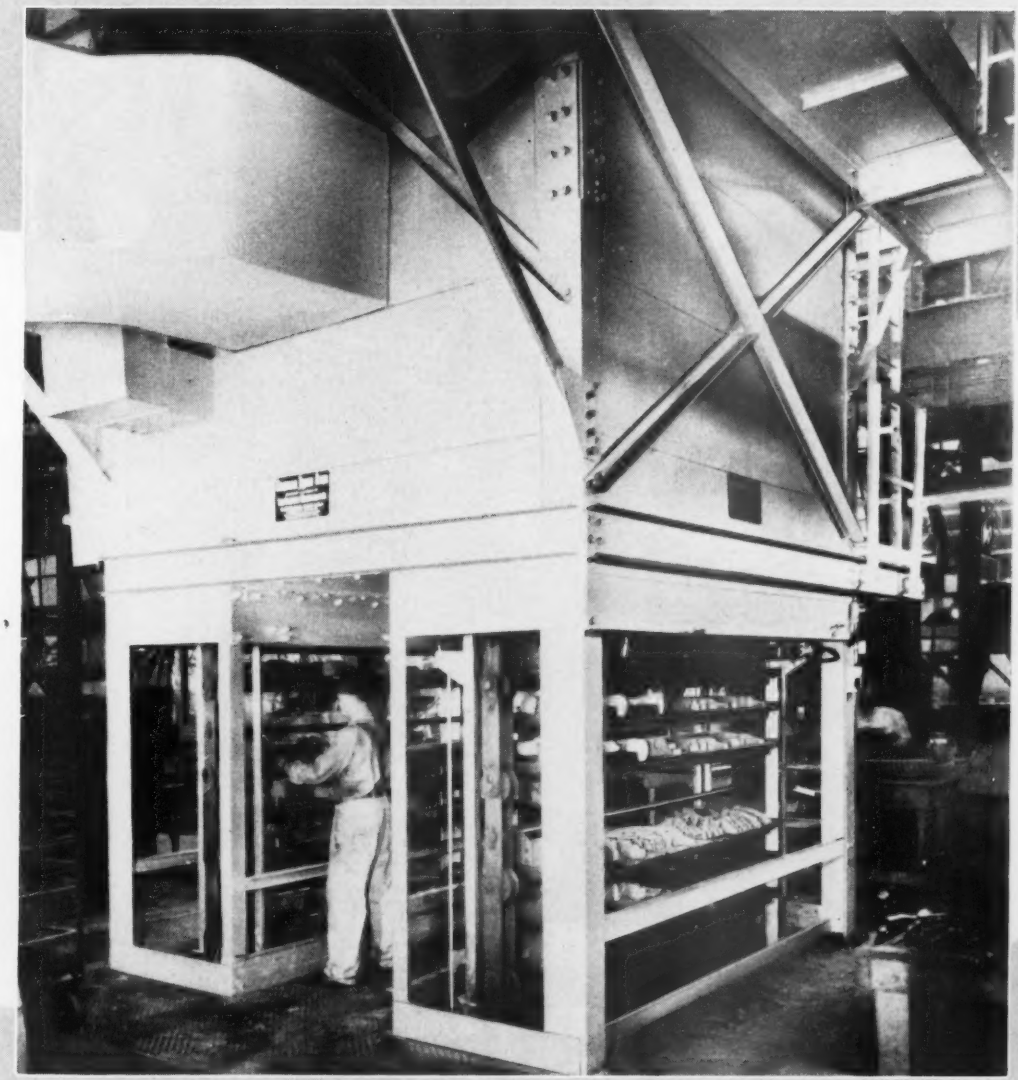
1831 COLUMBUS ROAD CLEVELAND 13, OHIO

MEMBER FEMA

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

COLEMAN OVENS

quality, with less manpower . . .



COLEMAN TOWER OVENS For high speed production at lowest cost. Patented Open Center permits loading from inside and out, providing maximum labor saving.

ONLY COLEMAN OVENS OFFER ALL THESE ADVANTAGES

GREATEST SAVINGS IN MAN-POWER resulting from methods which reduce handling and indirect labor to a minimum.

INCREASED PRODUCTION by making the most efficient use of skilled and unskilled labor.

PERFECT BAKING eliminates manpower and casting losses due to make-overs and rejects.

GREATEST SAVINGS IN FUEL by using the most economical fuel available.

MOST ECONOMICAL BINDERS for your particular casting requirements—oil or resin—can be used.

LOWEST MAINTENANCE COST for up-keep and service.

Come On In

Yes, come on in and join the ever increasing group of Smith L-O Core Oil users. Foundrymen who have swung to L-O find smooth going all along the production line. From core room to shake-out, Smith L-O superiority and dependability comes through to help produce sound, accurate castings — the type of castings that result in greater profits.

If you want a core oil that does a swell job, use Smith L-O . . . controlled for uniformity by the Dow-Therm method of heat treatment.

WAREHOUSE STOCKS AVAILABLE
In The Following Cities

- COLUMBIAN WAREHOUSE CO. Reading, Pennsylvania
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- F. F. SHORTSLEEVE Elmira, New York
- MALCOLM G. STEVENS Arlington, Massachusetts
- PACIFIC GRAPHITE CO., INC. Los Angeles 22, California
- TERMINAL WAREHOUSE Worcester 8, Massachusetts
- M. W. WARREN COKE CO. St. Louis, Missouri
- WESTERN FOUNDRY SAND CO. Seattle, Washington
- WESTERN INDUSTRIAL SUPPLY CO. Portland 14, Oregon

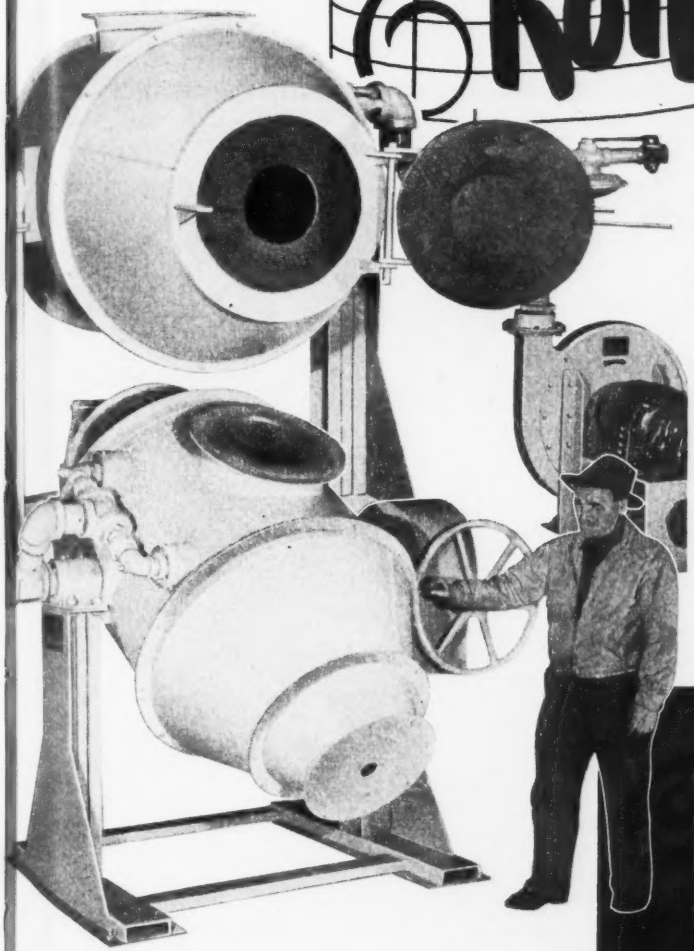
Smith L-O Core Oil

ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.
MANUFACTURERS OF L-O AND CERTIFIED CORE OILS
INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS

Roll Out the Barrel

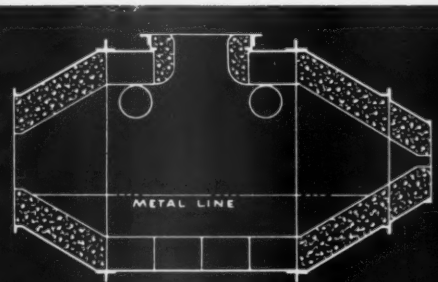
FOR MORE EFFICIENT ALUMINUM MELTING



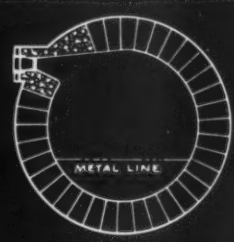
This is the new Stroman Model "BFC" Hand Tilt Barrel Type Melting Furnace for aluminum. This furnace features "Tangential Firing" which produces a most efficient combustion condition and creates a melting atmosphere in the furnace that keeps metal loss and dross accumulation at a minimum. The furnace may be charged through the top or through the rear door which is also used for drossing the molten metal and cleaning the furnace. It hand tilts forward, as illustrated, for pouring and draining. It is available in 500 pound capacities and is ideal for use in all foundries that melt aluminum, no matter if they are sand casting, permanent mold, or die casting plants. Remember, when you buy Stroman you buy the best . . . for Stroman sets the pace in the non-ferrous metal melting equipment field . . . They are the undisputed leader in building the most efficient and economical furnaces available. Let them help you with your melting problems. Write for full information today.

Top—Shows end charging and skimming door.

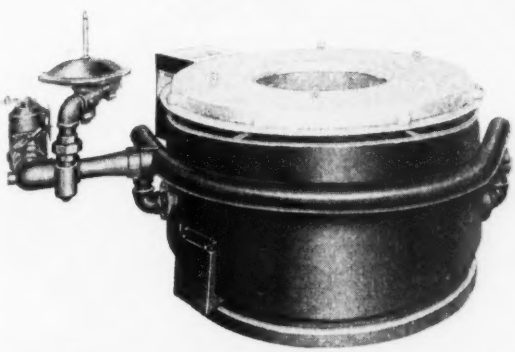
Bottom—Tilted in pouring position, showing top charging hopper.



CROSS-SECTIONAL VIEW THROUGH LENGTH

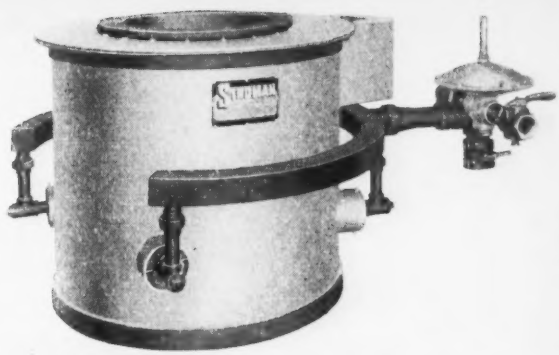


CROSS-SECTIONAL VIEW THROUGH THE DIAMETER



STROMAN RM STATIONARY CRUCIBLE MELTING AND HOLDING FURNACES FOR ALUMINUM

Built especially for use in permanent mold and die casting plants where molten metal is dipped from furnace with a hand ladle. Melting is done in crucible (no iron pick-up). Thoroughly insulated to protect the operator from heat. Oil, gas or combination oil-gas fire. Capacities, 200 to 800 lbs. Available with full automatic controls.



STROMAN IRON POT MELTING FURNACES FOR ZINC OR ALUMINUM

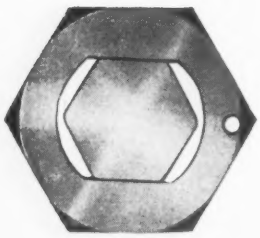
These furnaces are highly recommended as breakdown furnaces for zinc and aluminum die casting and permanent mold plants. They also excel as holding furnaces. They can be supplied either with or without hoods to exhaust fumes and heat. Their construction assures longest pot life and lowest fuel costs. Choice of automatic or manual controls and oil or gas fire. Capacities from 212 to 14,000 lbs. zinc.

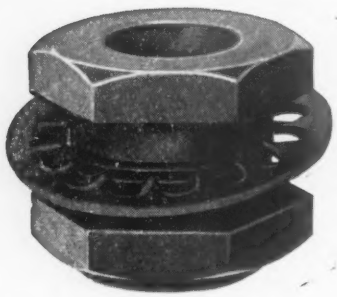
STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.

NOW...Better

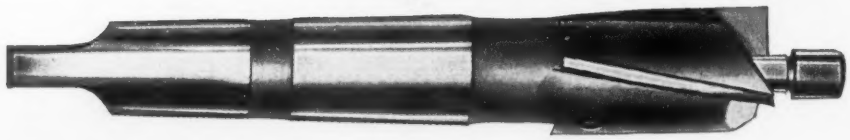




THE IMPROVED HINES PINS AND BUSHINGS

Our pins and bushings are now being produced by a new manufacturing technique. Closer tolerances are obtained by the new method, yet friction between pin and bushing has been reduced almost 50% — and the pins and bushings themselves are more uniform, harder and much better in every respect. They won't rust and they don't require lubrication. Because they are hardened and chrome plated, they resist wear. Extremely useful wherever good, accurate pins and bushings are required, they are just what your pattern department needs.

The original HINES pins and bushings are of our own design. They have been on the market for more than 25 years, and the hundreds of thousands now in use are still giving good service. This wide acceptance is conclusive evidence of their usefulness in all foundries.



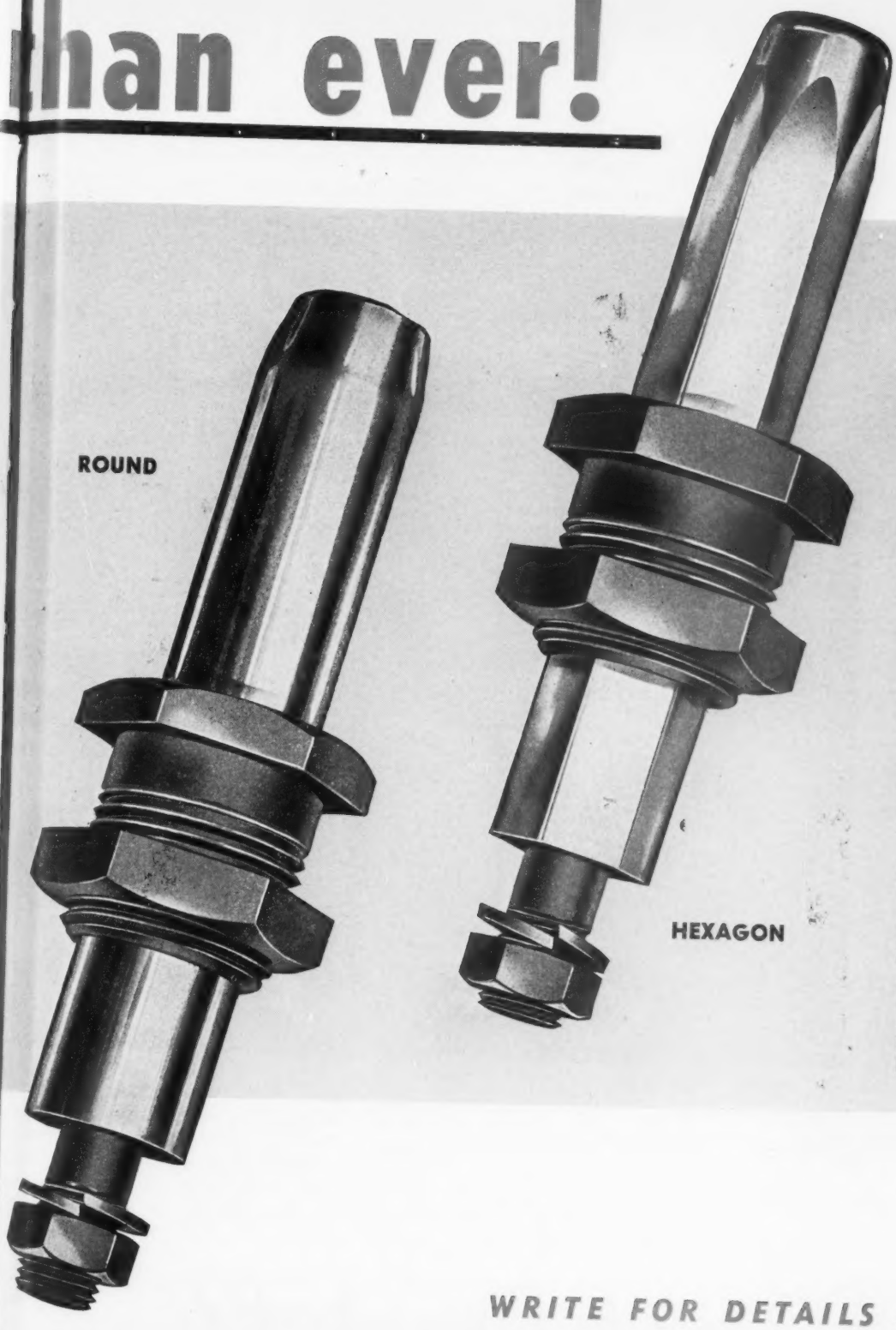
TOOLS FOR INSTALLATION

This counterboring tool and wrenches are the only tools needed for an installation of Hines Pins and Bushings.

THE HINES

3431 WEST 140th ST.

than ever!



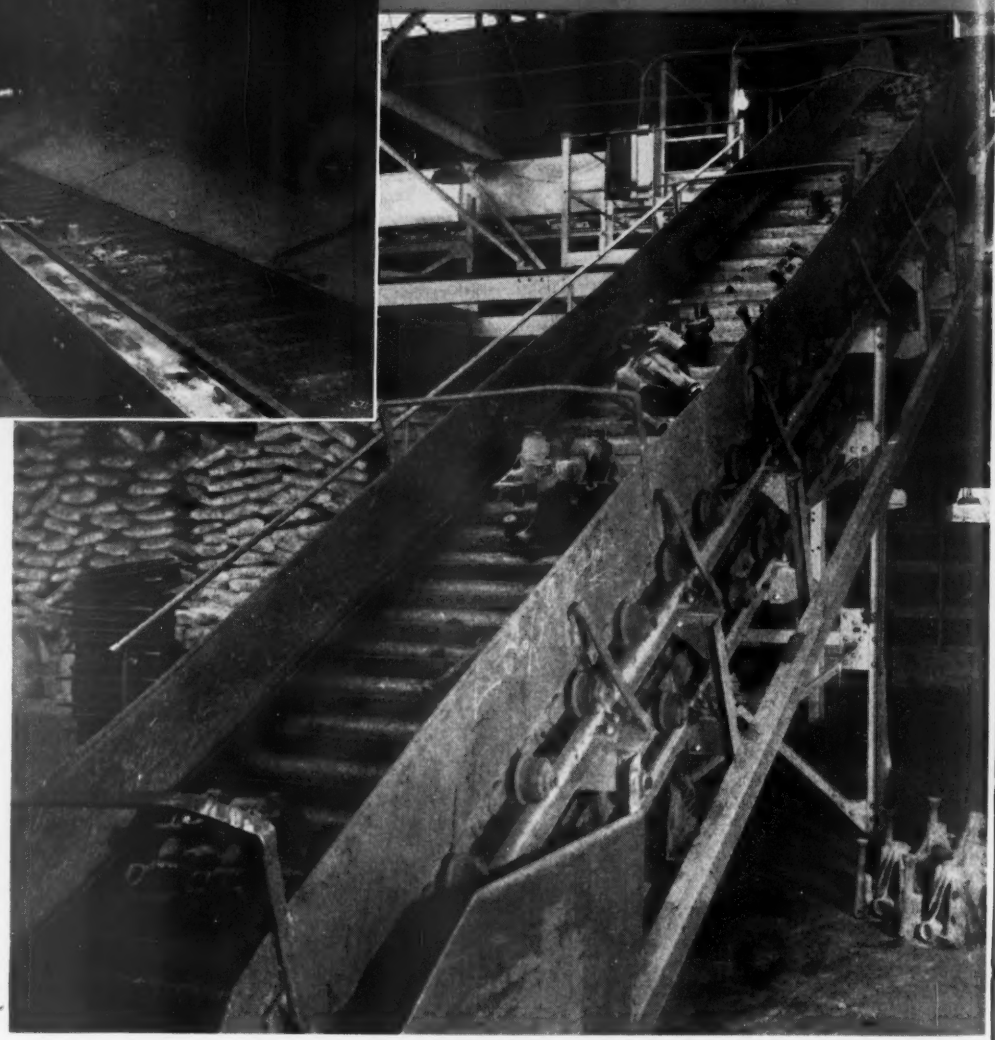
- CLOSER TOLERANCE
- NO BINDING
- NO LUBRICANT
- HEAVY CHROME PLATE
- NO RUSTING
- RIGIDLY INSPECTED
- GUARANTEED

WRITE FOR DETAILS AND PRICES

FLASK CO.

CLEVELAND 11, OHIO

CASTINGS TAKE A RIDE...on the level and even *UPHILL*



Steel Apron Conveyors—leak-proof and bench high — are doing a real job in this modern foundry. They keep castings on the move in a way that spells increased production—lower costs. Accurately-formed double-beaded flights with ends arc-welded tight. Cleats are welded onto conveyor (at right) to prevent back flow when carrying up steep inclines.

- Clamshell Valves
- Bucket Elevators
- Belt Conveyors
- Core Crushers
- Disintegrators
- Electric Vibrating Feeders
- Pivoted Bucket Conveyors
- Flask Fillers
- Mold Conveyors
- Rotary Breaker Screens
- Sand Mixers
- Sand Aerators — Blenders
- Scraper Conveyors
- Transmission Mach'ry

IMPORTANT Breakdowns in production lines are costly. Jeffrey Foundry Engineers are thoroughly familiar with the severe conditions encountered in the modern foundry. Service includes survey, followed by study and preparation of equipment layouts to suit varied requirements. They are specialists . . build for you, whether your foundry is large or small. Write us today.

THE JEFFREY MANUFACTURING COMPANY

ESTABLISHED 1877

907 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

Baltimore 2 · Beckley, W. Va. · Birmingham 3 · Boston 16 · Buffalo 2 · Chicago 1 · Cincinnati 2 · Cleveland 15 · Denver 2 · Detroit 13 · Harlan, Ky. · Houston 2 · Jacksonville 2 · Milwaukee 2 · New York 7 · Philadelphia 3 · Pittsburgh 22 · St. Louis 1 · Salt Lake City 1 · Scranton 3

Jeffrey Mfg. Co. Ltd., Montreal, Canada
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S.A.
The Ohio Malleable Iron Co., Columbus, Ohio
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The Galion Iron Works & Mfg. Co., Galion, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio

You can get smoother cores with MOGUL

• CUTS DRYING TIME • CUTS DOWN DISCARDS

Full technical service, without obligation, is available to show how you can profit from the use of MOGUL® Cereal Binder in your production.

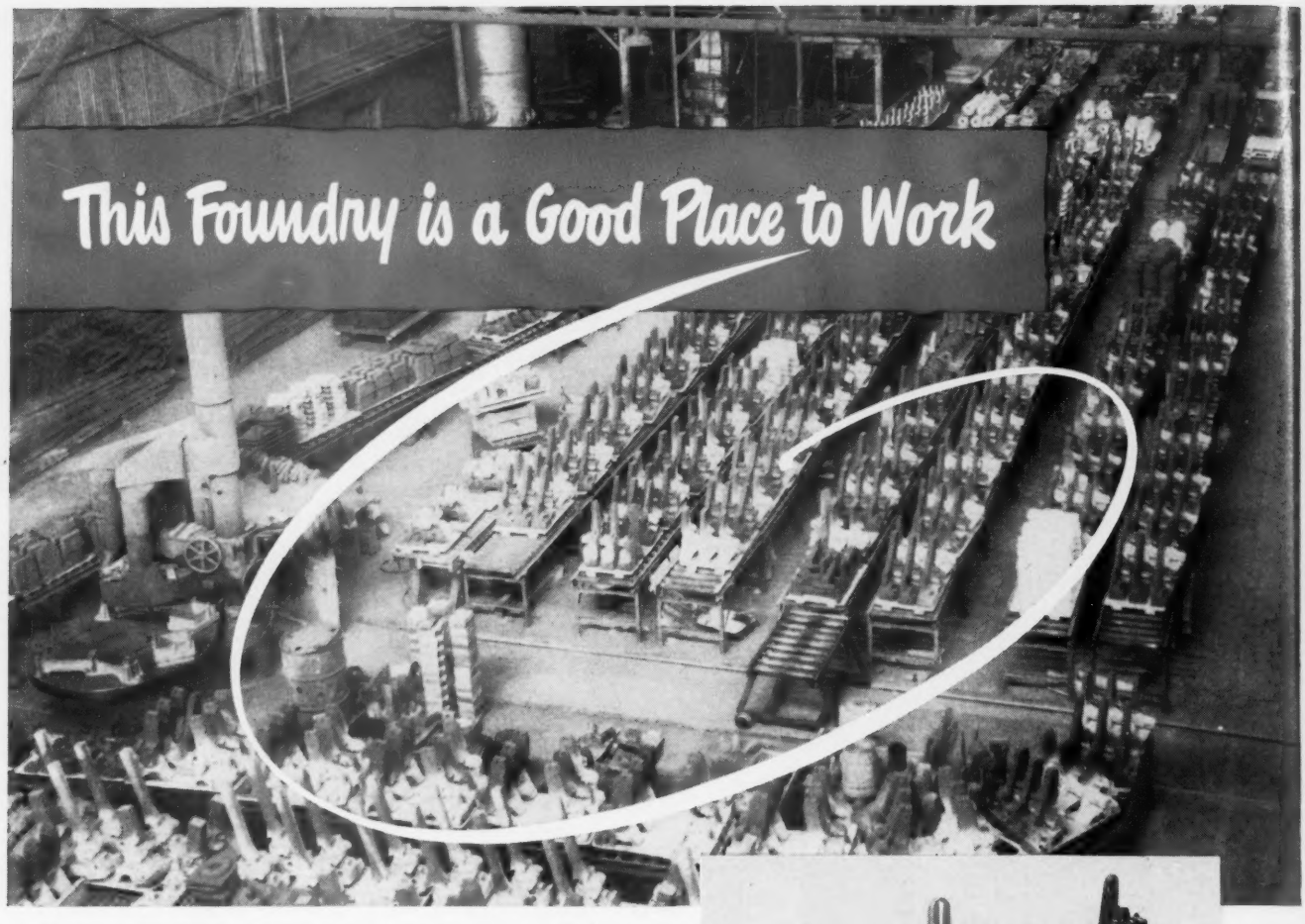
Write Technical Sales Department

CORN PRODUCTS REFINING CO.

17 Battery Place • New York 4, New York

LARGEST SELLER IN THE FIELD!

the preferred dry bond for cores



National Malleable & Steel Castings Company, Sharon, Pa.

THIS plant, one of five in an 83-year old company, produces freight car couplers; tight lock couplers—primarily used for high speed streamlined passenger trains; side frames; bolsters; chain; and other heavy-duty steel products.

It is a good place to work because it offers its community people steady, safe and clean employment. This has been brought about by Sharon management's policy, backed by hearty cooperation from company officials, of almost ceaseless modernization.

Its molding units, conveyors and materials handling systems are up to date in every respect. The plant has won awards for its safety and good housekeeping records.

Fifty one years of continuous operation make National Malleable the oldest industry in the Shenango Valley and its interest in its employees is best reflected by the 375 people with over 15 years of service.

Herman Molding Machines have been used at Sharon for a long time. The 3000 lb. capacity

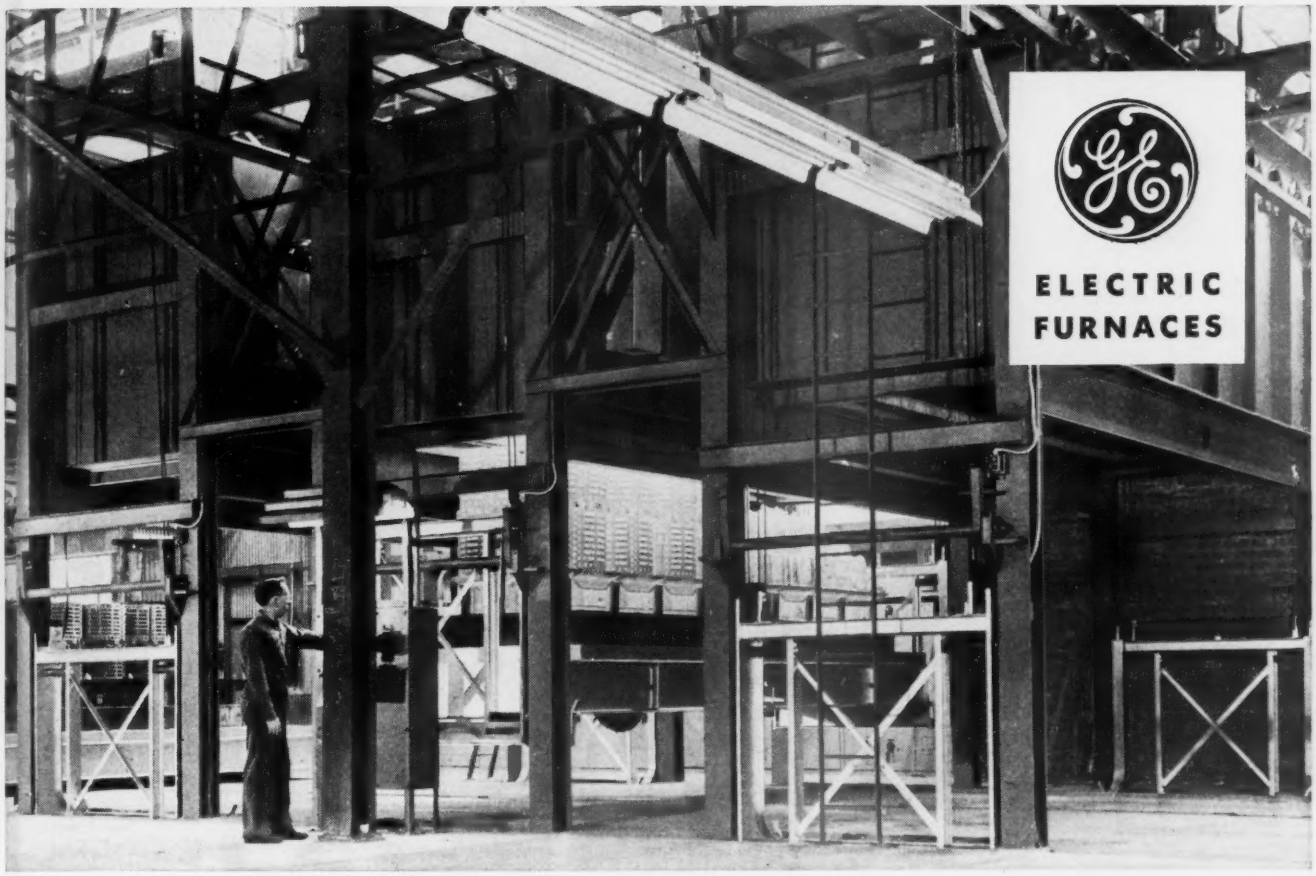
machine shown herewith is representative of many now in use. They contribute toward Sharon's reputation as a good place to work, by their efficiency and simplicity of operation. One valve assures fast, smooth hydraulic action for mold rollover and pattern draw. They are ruggedly built and quality engineered.

At Sharon, and everywhere. Hermans have made their way by the way they're made.

Herman **MOLDING MACHINES**

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

Annealing Time Cut 61%



How General Metals Corp. reduced annealing time from 84 to 32 hrs.

Like many other progressive companies, such as the General Metals Corporation, Vernon, California, you may find you can drastically cut annealing time, reduce annealing costs, and achieve better, more uniform results by installing G-E electric furnaces.

General Metals, for example, reduced the annealing cycle for malleable iron from 84 to 32 hours by installing G-E elevator furnaces, which occupy only half the floor space formerly required by fuel-fired furnaces!

CUT COSTS In addition, General Metals cut costs considerably by eliminating the packing, shaking out, cleaning and tooling operations which their operators had to perform using fuel-fired furnaces.

ASSURE QUALITY ANNEALING Because the G-E furnaces provide automatic control of the temperature and heat-treating cycle, along with uniform heat distribution, uniform quality of annealing is assured . . . even with unskilled help.

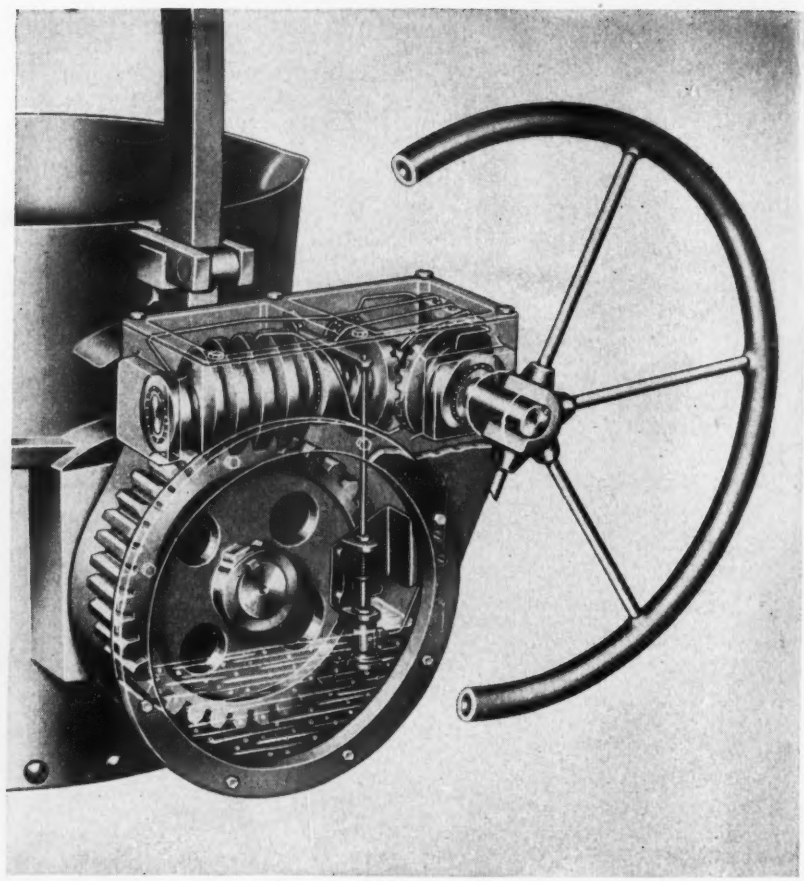
General Electric builds a complete line of electric furnaces, gas atmosphere equipment, induction and dielectric heaters, and small heaters and heating devices. Just contact the G-E Apparatus Sales Office nearest you to obtain the recommendations of an Industrial Heating Specialist or write to: *Sect. 720-40, Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

720-40

Electric Furnaces For Annealing • Brazing • Drawing • Carburizing • Enameling • Hardening • Normalizing • Sintering • Steel Mill Applications

GENERAL ELECTRIC

New Worm Ladle Gearing ELIMINATES GASKET ADJUSTMENTS



. . . WORM AND BEVEL GEAR ASSEMBLY COMPLETELY ADJUSTABLE

- **Completely enclosed and self contained**
- **Automatic force-feed lubrication**
- **Positively self locking in any position**
- **Precision cut gears**

Here is another Industrial Equipment Company first . . . new, improved worm ladle gearing bringing *complete universal adjustability.*

Take a close look at the phantom view. Here is a one-piece, self-contained unit with all parts easily accessible. Your maintenance man can quickly make back-lash adjustments to pin-point accuracy and positive adjustment by adjusting the bearing lock nuts on all gears and worm. These nuts are easily reached and with working space to spare.

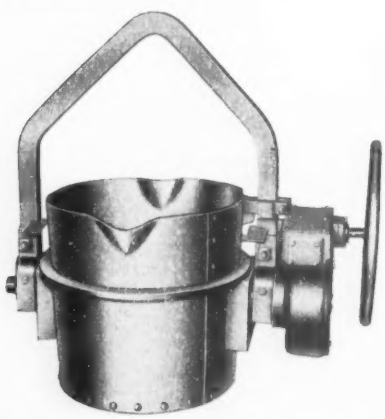
Unaffected by Heat

There is no connection between the bail and the gearing. No clearance for heat distortion is necessary, permitting an assembly almost to machine tool precision.

Industrial's new gearing is absolutely safe and positively self locking. The high ratio between worm and worm gear locks the ladle in any position. Incidentally, worm and bevel gears are of high tensile semi-steel and the worm is of high alloy steel. All are precision cut. Shafts are mounted on anti-friction bearings.

Now Standard Equipment

All Industrial geared ladles are now supplied with this outstanding new type of gearing. In addition, this gearing can be supplied for any Industrial worm geared ladles now in operation. *Write for details.*



Model 592T ladle with new type gearing. Also notice use of Industrial Equipment's much talked-about UNIVERSAL BAIL. This bail completely eliminates binding due to heat distortion or misalignment. Rigid bail also available.

Do you have our revised catalog No. 35?

Industrial
EQUIPMENT COMPANY
115 N. Ohio St., Minster, Ohio

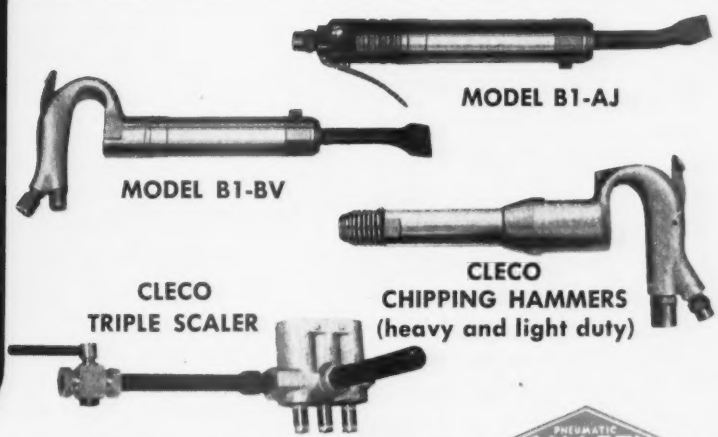
LADLES • BOWLS • SHANKS • BAILS • TONGS • SPECIAL EQUIPMENT

EVERY SHOP NEEDS THIS TOOL OF A HUNDRED USES . . .

CLECO
B-1 PNEUMATIC SCALING TOOL
for

- Swivel control valve prevents twisting of air hose
- Air admitted by hand pressure on tool
- Adjustable throttle valve controls power
- Steady jet of exhaust air removes chips
- Positive and sturdy chisel retainer

- Removal of weld splatter
- Rust and paint scrapings
- Cleaning sand from small castings
- General scaling, beading and peining



MODEL B1-AJ

MODEL B1-BV

CLECO CHIPPING HAMMERS (heavy and light duty)

CLECO TRIPLE SCALER

WRITE FOR BULLETIN 84

CLECO AIR TOOLS

PNEUMATIC DALLETT EQUIPMENT ACCESSORIES

CLECO DIVISION

of the REED ROLLER BIT COMPANY, 5125 Clinton Drive, Houston 20, Texas, U.S.A.

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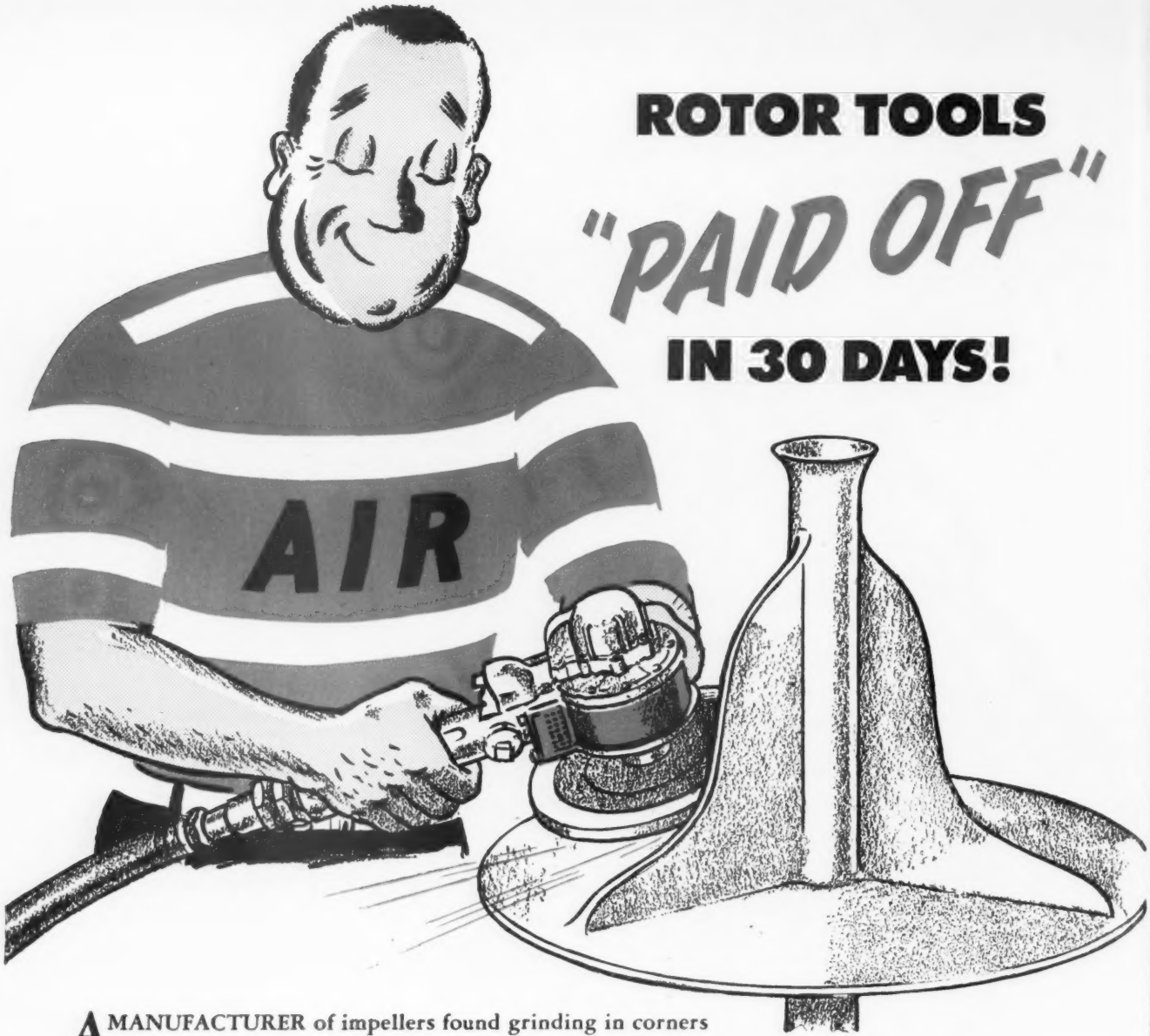
2701

ROTOR TOOLS "PAID OFF" IN 30 DAYS!



A MANUFACTURER of impellers found grinding in corners and around curves a tough, time-taking job. Then the Rotor Application Engineer gave his recommendations.

Straight wheel and cone grinders were replaced with Rotor Air Verticals that use 9-inch flexible sanding pads. This eliminated all wheel marks, made it possible to get into those curves and corners, and use the same type grinder for all operations.

The result—a 21% reduction in grinding time. Thus the Rotor tools paid off their cost in less than 30 days. Production quality is better too.

Want to get similar benefits in your grinding operations? Call in the Rotor Application Engineer, or write for Catalog 35.

AIR O'TOOL

THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

MOLD DRYING TIME REDUCED *to a minimum*

Automatic Features

ARE INCORPORATED IN

NEW Mold Drying Ovens

by

CARL-MAYER

From an article in May, 1950 issue of The Foundry

PICTURED here are views of two new modern drying ovens recently installed in the Oil Well Supply Co.'s foundry located in Oil City, Pa. This U. S. Steel subsidiary manufactures oil country machinery of all types and its foundries produce a wide weight range of both iron and steel castings, many of which are cast in dry sand molds. Through the medium of forced circulation and recirculation of hot gases or products of combustion, mold drying time is reduced to a minimum.

Each oven, having a capacity of 120,000 lb, is loaded by a mold-carrying car permanently connected to an under-the-floor automatic car pulling device, which by means of limit switches, cannot be operated until the oven door is wide open. Heat is produced in a dual fuel combustion chamber on top the oven, with an external mix type burner using either natural gas or fuel oil, the burners being provided with automatic fuel changeover devices as well as shutdown safety devices in case of fuel or power failures.

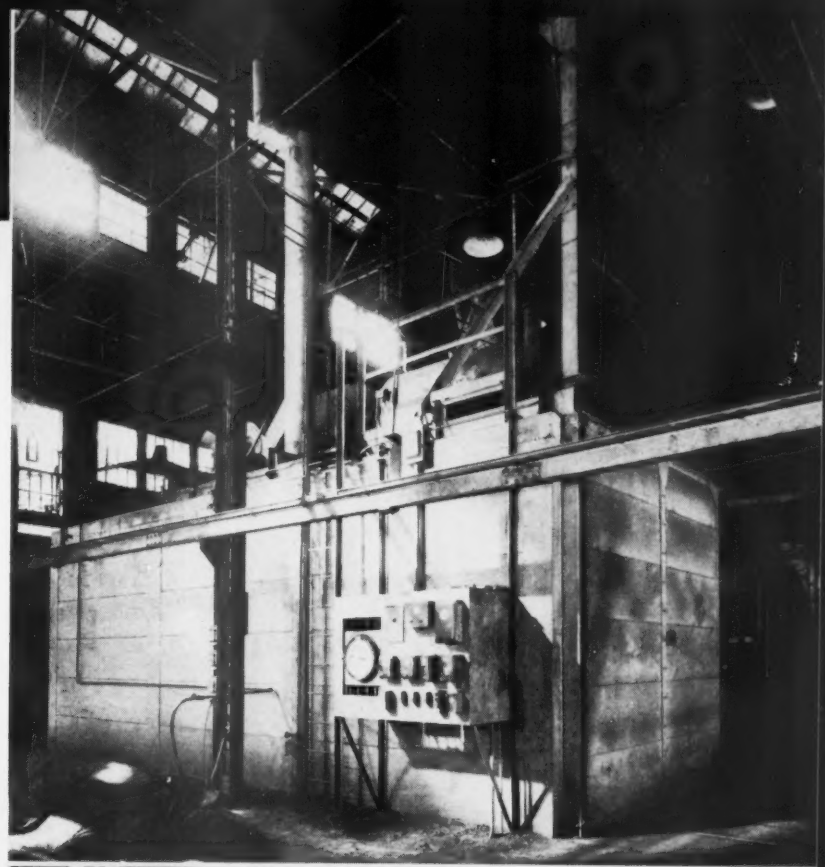
The combustion chamber, which consists of an insulation-covered stainless steel inner lining encased in a steel housing, is connected to a high-temperature fan of 13,000 cfm capacity, forcing the products of combustion through ducts discharging at floor level along both sides of the oven. The circulated hot gases are drawn out through ceiling ducts and about 70 per cent again go through the combustion chamber and are recirculated.

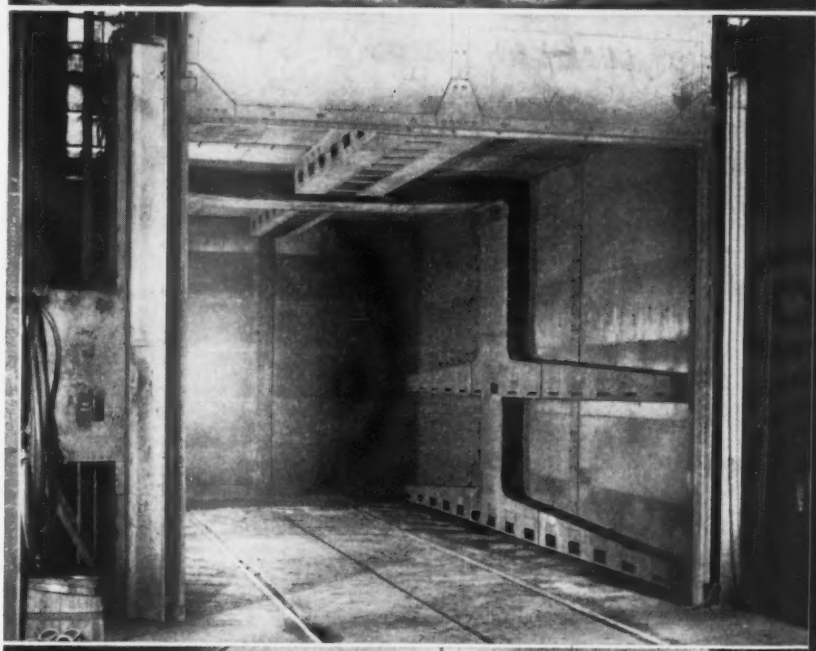
Prefabricated double wall sections, consisting of 5-in. thick glass wool insulation covered by 14 gage steel sheets, make up the oven walls and ceilings, and reduce firing time to 65 per cent of the mold drying time. The drying time cycle is completely automatic and in addition to the many safety protection devices, there is a delayed time firing device whereby the ovens are completely purged of any residual gases before the combustion chamber is ignited. The units were designed, fabricated and installed by

The Carl-Mayer Corp.

3030 Euclid Ave., Cleveland, Ohio

Over thirty years' experience in building all types of Core and Mold Ovens.





The most economical mover of metals available

DINGS NEW LIFTING MAGNET
Improved these ways . . .

BIG IMPROVEMENTS LIKE: moisture-proof, shock resistant all welded construction • A finer insulating compound—vitally important because of its ability to dissipate strength-sapping heat • Four point chain suspension—another Dings exclusive—for less swinging and tipping, bigger loads and much better all around control • *Scientifically balanced magnetic circuit*—the crux of a great magnet—means all magnetic strength into the lift. Proof of this lies in the extremely low heat rise.

LITTLE IMPROVEMENTS LIKE: protector plate guards, waterproof, shatterproof, jerk resistant molded neoprene neck cable connectors, tamperproof sealed terminal box and many, many others.

THEY ALL ADD UP TO: the new Dings lifting magnet—successfully designed for lighter weight, bigger payload and longer life.

LIGHT!

IN PROPORTION TO LIFT!

MOISTURE-PROOF!

IT'S ALL WELDED

A COOL OPERATOR

LOW HEAT RISE MEANS MORE LIFT!

TROUBLE-FREE!

A DOZEN NEW FEATURES KEEP IT THAT WAY!

Get Details on Why This New Dings MOVES MORE, FASTER, AT LESS COST. Send Now for the Lifting Magnet Catalog.

DINGS MAGNETIC SEPARATOR COMPANY
4708 Electric Ave., Milwaukee 46, Wisc.

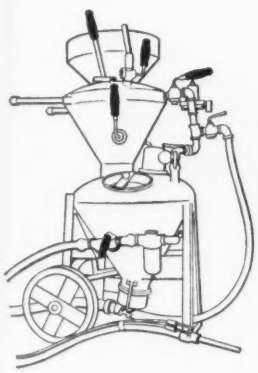
Dings Magnets

World's Largest Builder of Electric and Non-Electric Magnetic Separators for All Industry

for the PEAK in efficient cupola operation.....

use *Cupoline*

FOR EFFECTIVE, LOW COST CUPOLA PATCHING



Cupoline Bondact Mix is proportioned for use in the Bondactor Patching Machine. The batch is air-applied by gun. This gives speed, long life and low cost. You eliminate the variables in hand mixes. You eliminate also joints and points of weakness in the patch. Contour patching is rendered elementary.

● Uniformity of blast rate, burnout, and air density are dependent on uniform cupola diameter. Patching your cupola with Cupoline will assist in maintaining that uniformity. Cupoline is a scientifically premixed, monolithic refractory which forms a patch of high density, distinguished by long life and low cost. Patching is simple and cupola performance improved.

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JACKSON, OHIO

DIXIE BOND • BLACK HILLS BENTONITE
REVIVO BOND • REVIVO SUPER BOND
BALANCED REVIVO

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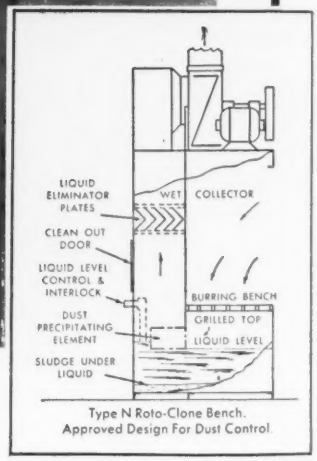
BONDING CLAYS and EXCEPTIONAL FOUNDRY SERVICE

Since 1926

BONDACTOR EQUIPMENT • CUPOLINE REFRACTORY • DURA PRODUCTS

today's best buy is better air!

Type N Roto-Clone Bench for Magnesium Finishing Operations.
Dictaphone Corporation, Bridgeport, Connecticut



Type N Roto-Clone Bench.
Approved Design For Dust Control.

NO FEAR HERE...
of dangerous magnesium dust!

AAF Roto-Clone Type N Bench Eliminates Hazards Of Magnesium Finishing Operations.

The Type N Roto-Clone* dynamic precipitator has a remarkable safety record in efficient collection and safe storage of dangerous dust. Developed by AAF engineers for magnesium finishing, this unit or bench type wet-collector has no moving parts, pumps or nozzles, yet maintains the highest efficiency in collecting extreme fines.

The Type N Roto-Clone immediately removes incendiary dust from the source by passing entrained material through a sinuous water curtain under heavy turbulence . . . induced by the flow of air through a stationary impeller. Dust is stored at once in sludge form within the base of the self-contained unit, and under water for complete safety.

The eleven sizes and three arrangements of Type N meet requirements for all dangerous finishing operations, such as stand grinding, burring, buffing, sawing, etc. Unit design also provides additional safety factors by allowing isolation of operations.

If incendiary dust is one of your problems, call your nearby AAF representative or write for Engineering Bulletin No. 277 A.

**Roto-Clone, is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

AAF American Air Filter
COMPANY, INC.
266 Central Ave., Louisville 8, Kentucky • In Canada: Darling Bros., Ltd., Montreal, P. Q.

LET'S TALK ABOUT ONE FOUNDRY WHERE DESULFURIZING LADLE LININGS OF AIR-RAMMED IRONTON "NOJOINT"

NOW give 4 times longer service at only 2/3 the cost!

AN ACTUAL CASE HISTORY is the basis for the interesting comparison of costs and service we are talking about here. A copy of the report, with all details and product names, is yours on request.

THE FOUNDRY which supplied the facts we report is desulfurizing in 3500 and 5350 pound U-shaped ladles. Foundrymen add about two pounds of "Purite" per ton of metal, and pour an average of 250 tons a day.

LADLES lined with refractory brick and other well-known products used for this purpose gave three to five days' service, handling 750 to 1200 tons of iron.

INSTALLED in accordance with factory-approved practice, an air-rammed lining of Ironton *NOJOINT*, wash-coated with Ironton *BERLITE*, lasts 18 days, handles 4500 tons of iron. That's up to six times the service other refractories gave.

WHAT ABOUT COSTS? Figuring everything in . . . labor, downtime, installation and maintenance expense, and the cost of lining materials . . . the old way cost about $18.00 a day. On the same basis, a lining of Ironton *NOJOINT* costs $12.00 a day.

Our Service Engineer will come to your foundry to show you how to make this saving. Ironton sales representatives have full information. Telephone the nearest office listed at the left.

Baltimore, Maryland	MUlberry 7184
Boston, Mass.	HAncock 6-1210
Buffalo, N. Y.	TAylor 2091
Charlotte, N. C.	55-285
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Hartford, Conn.	33-0941
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Jacksonville, Florida	3-5586
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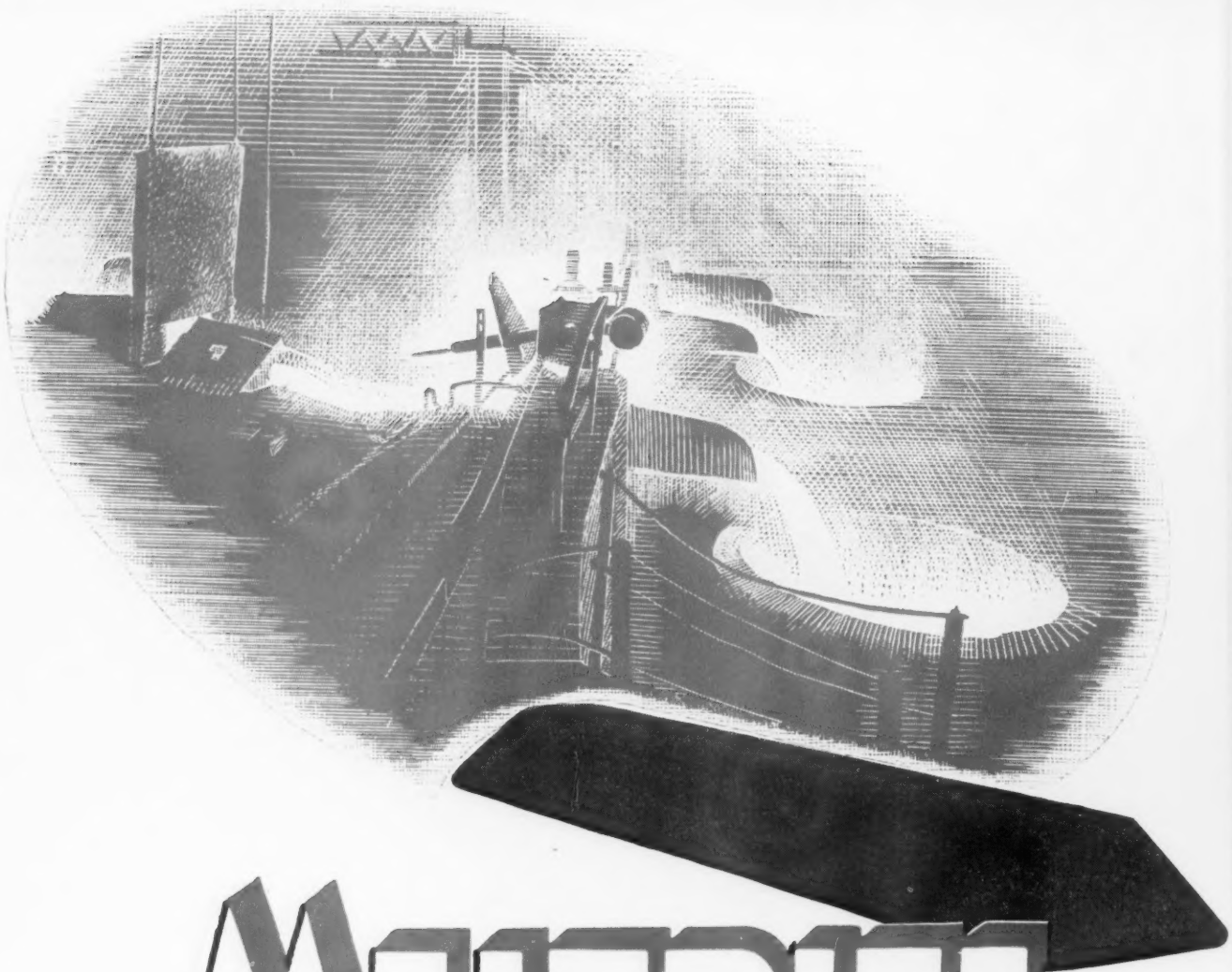
Call or Write Today

RELIABLE REFRACTORIES

THE IRONTON FIRE BRICK COMPANY
IRONTON, OHIO

BERLITE • ALSET
CARO-LINE • NOJOINT • SPECIAL SHAPE REFRACTORIES
KENTUCKY CLAY FIRE BRICK PRODUCTS



MELTRITE

PIG IRON

UNIFORMITY OF ANALYSIS

MORE USED THAN ANY OTHER MERCHANT PIG IRON

P M

PICKANDS MATHER & COMPANY

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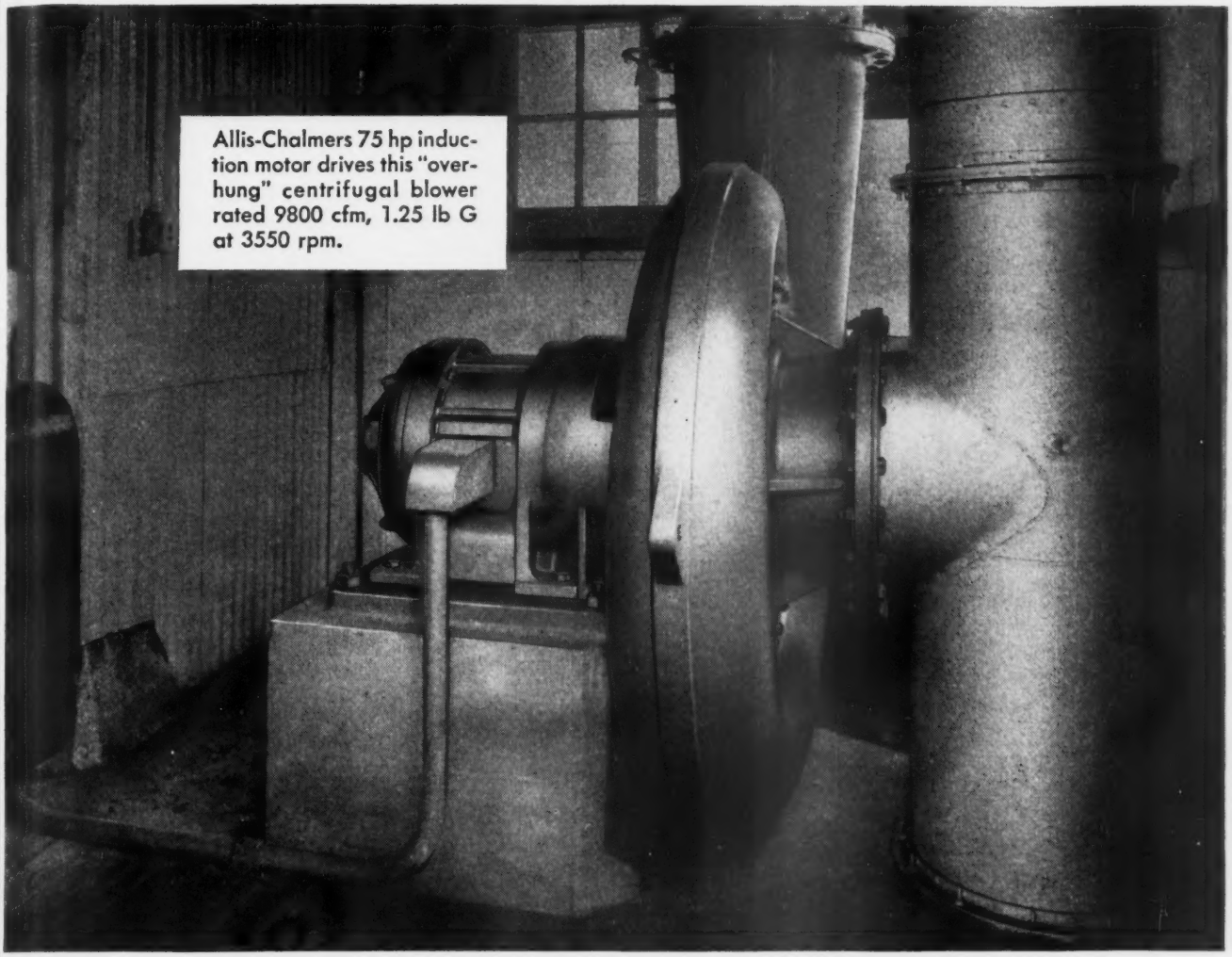
SIXTY-EIGHT YEARS OF
SERVICE TO INDUSTRY



Allis-Chalmers 75 hp induction motor drives this "overhung" centrifugal blower rated 9800 cfm, 1.25 lb G at 3550 rpm.

14 Years at Hard Labor!

TALK ABOUT RELIABILITY, this foundry cupola blower has run continually for 14 years — 11 years consecutively with no repair whatsoever! Installed in 1937 at the repair shop of a large western railroad, this centrifugal blower operated steadily and with only routine maintenance until 1948. The anti-friction bearings then were replaced and the blower has remained in repair-free operation since.

This blower-drive-motor control "team" — all Allis-Chalmers — supplies the desired amount of air for the operation of a foundry cupola. And this blower's performance is vital since the maintenance of rail transportation depends upon the fast availability of grey iron repair parts.

This kind of reliable performance is not at all unusual for Allis-Chalmers centrifugal blowers, even in foundry service. The cast iron casing reduces vibration, lowers noise level, and gives long life impossible with fabricated construction. The one moving part, the impeller, is "overhung" on the motor shaft and supported by long-lived anti-friction bearings. As seen in the photo above, the entire installation is compact and readily accessible.

If *you* want this kind of performance and convenience in *your* foundry, specify A-C blowers for cupola installations and replacements. For complete information call your nearest A-C sales office or write to Allis-Chalmers, Milwaukee 1, Wis. for Bulletin 16B6048A.

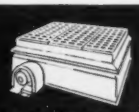
A-3302

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

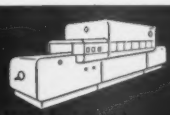
Foundromatic and *Regulex* are Allis-Chalmers trademarks.

Foundry Equipment for Bigger Output-Better Working Conditions!



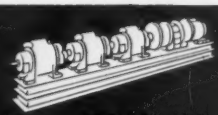
FOUNDROMATIC SHAKEOUTS

MOTORS-DRIVES-CONTROL



FOUNDROMATIC CORE DRYER

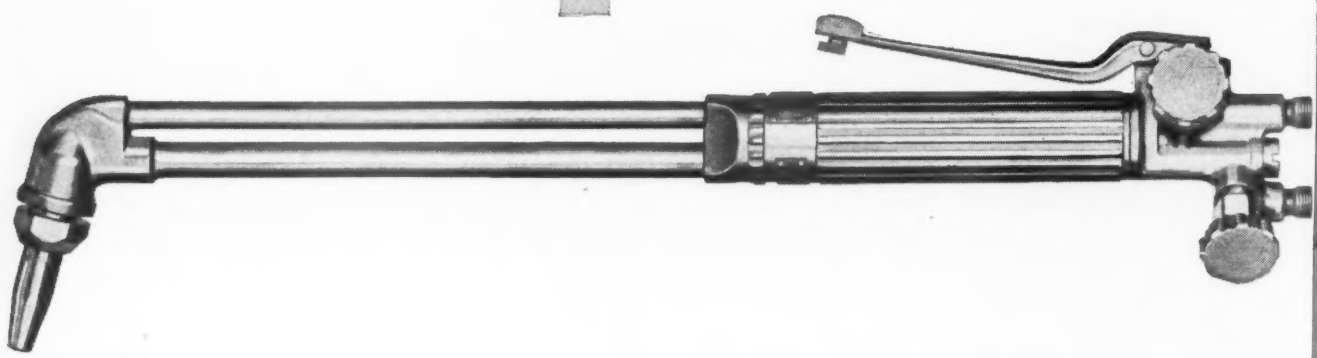
INDUCTION HEATING & MELTING



REGULEX ARC FURNACE CONTROL

Do all this with *One* OXWELD Trade-Mark Blowpipe

- **Cut steel up to 12 in. thick**
- **Bevel parts for fabrication or repair**
- **Gouge grooves of many sizes and contours**
- **Deseam semi-finished steel forms**
- **Cut risers and "wash" pads**
- **Prepare plate edges for welding**
- **Remove rivets and pierce holes**
- **Trim plate and structural shapes**
- **Powder-cut stainless steels and other oxidation-resistant metals**
- **Cut guided circles and straight lines**
- **Scrap obsolete equipment for profit**



Whether your work includes one or more than one of these jobs, the OXWELD C-32 Blowpipe will save you time and money. This all-purpose cutting blowpipe, with its wide variety of inexpensive nozzles and attachments, easily handles these jobs—and many others—with outstanding efficiency, speed, and convenience.

Like all OXWELD products, the C-32 is built to give you many extra years of economical and **trouble-free service** under every condition of use. Available in your choice of 3 lengths (20-, 26-, and 32-in.) and 3 head angles (75-, 90-, and 180-deg.) to suit your exact needs. Write or phone today for full information about this cutting blowpipe — or regarding welding blowpipes, regulators, cutting machines, or acetylene generators.

The terms "Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde Trade-Mark

LINDE AIR PRODUCTS
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
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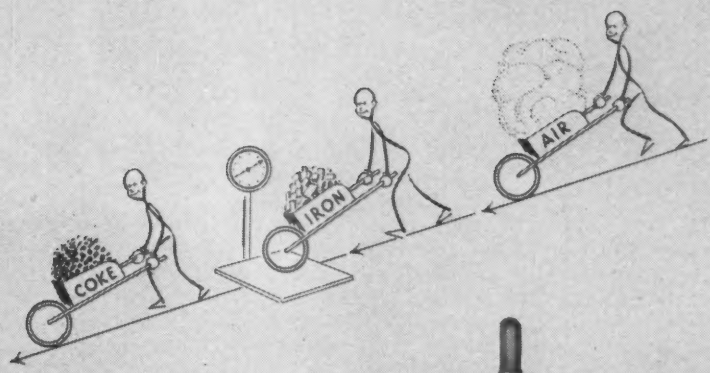
Foundry costs come down

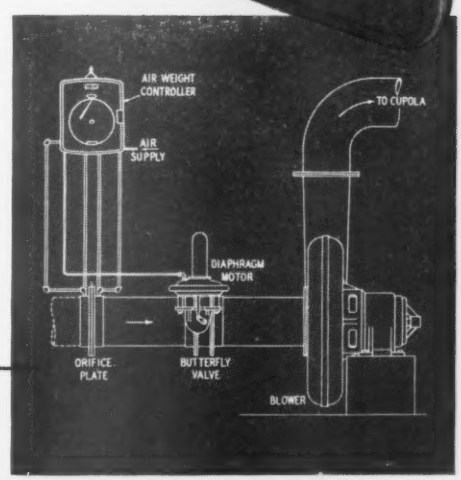


... when you weigh air too

Leading foundries report lower fuel costs, fewer rejects, and less pigging after installing Foxboro Air Weight Control. That's because the cupola blast is fully compensated for every change in atmospheric pressure and temperature. *The right amount of oxygen for the quantity of coke charge* insures better combustion, more uniform heats and better quality castings.

Foxboro Air-Weight Controllers automatically control cupola blast by *weight of air* instead of volume. They are one of Foxboro's many original developments in instrumentation to cut industrial costs. Representative installations will be found throughout the foundry industry. The names of those located nearest you will be gladly sent on request.

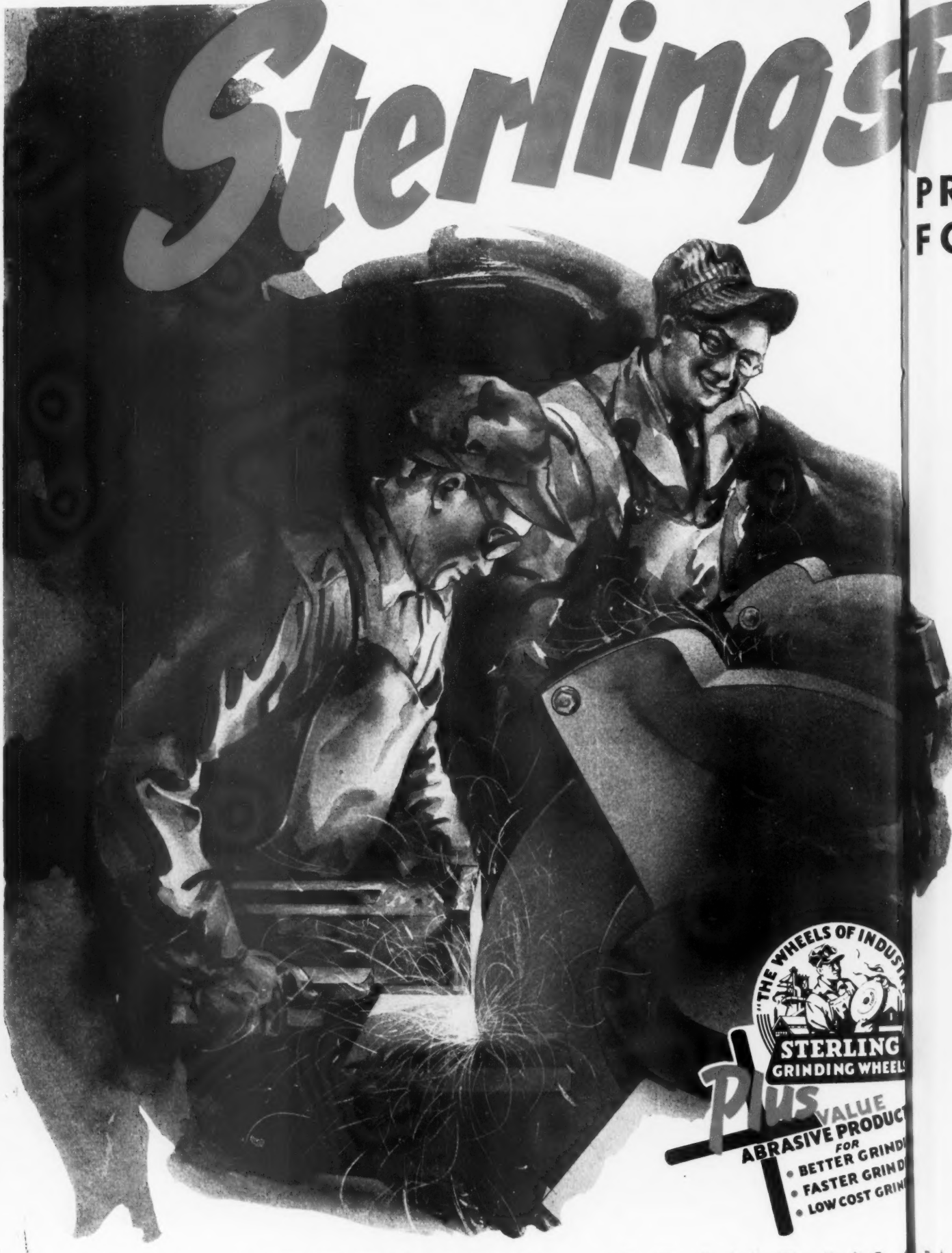
Now, . . . you can make the most of modern foundry practice by installing the advanced-design Model 40 Air-Weight Controller by Foxboro. Installation is easy and fast. Results will far outweigh the investment. Write for complete details. **The Foxboro Company, 323 Neponset Avenue, Foxboro, Mass., U. S. A.** Branches in principal cities.



Typical installation set-up of Foxboro Air-Weight Control . . . readily adaptable to either a centrifugal blower (shown in diagram) or a positive displacement blower.

FOXBORO REG. U. S. PAT. OFF. **AIR-WEIGHT CONTROLLERS**

Sterling's F



THE STERLING GRINDIN

"F" and "P" HIGH SPEED BONDS

PROVIDE A QUICKER SOLUTION FOR FOUNDRY GRINDING PROBLEMS

Two Sterling Foundry Grinding Wheel bonds, each a product of Sterling's Research and Development Program, satisfy all high-speed foundry grinding demands. These two resinoid bonds–"F" and "P"–are distinctly a Sterling idea. When either is used in a wheel in proper combination with various kinds of abrasive grains, wheel structures, and grades, it provides the best possible foundry grinding. Being "tailor-made" to meet special applications, these wheels do specific jobs better, faster, and at lower cost.

In concentrating their efforts on perfecting these two bonds, Sterling technicians eliminated most of the time needed to select the proper wheel for your job. "F" or "P" Bonds "fill the bill" where other wheels demand a wider bond choice – hence, need more planning time – for producing the proper abrasive unit for floor-stand or swing-frame grinding.

The unusual efficiency built into Sterling Foundry Grinding Wheels provides many desirable features for users of these "Wheels of Industry." Deliveries can be made from our plant to you much more rapidly . . decisions as to special wheel formulas can be more quickly determined . . you can order and reorder with confidence in identical formulas being maintained.

Sterling's ability to turn out quickly the precise grinding wheel you need is important, and will become more so as emergency production continues. Sterling engineers can make immediate time-saving decisions as to the correct wheels for the solution of your grinding problems. Our modern manufacturing processes mean rapid flow of your order through our plant. A letter from you will bring expert cooperation at no cost or obligation. Write us and we will follow through at a fast pace.

BEST IN THE TEST --- THAT'S STERLING

Exhaustive, competitive tests of Sterling Grinding Wheels are being held daily in leading foundries all over the country. Time after time, Sterling's "Wheels of Industry," because of faster, better, lower-cost grinding on high-speed portable, swing-frame, or floor-stand operations, eliminate all competition . . . lead the field!

Such test results are proof positive of Sterling's important contribution to breaking foundry production records . . . may we help you break records in your grinding departments?

Send For These STERLING Research and Development Folders

These interesting folders describe the importance to you of Sterling's Research and Development Program and outline various grinding specifications for different types of tools and the entire range of metals. Also included is the popular, informative book, "The Art and Science of Grinding." Write today for your set of these folders . . . no obligation whatever.

WHEEL DIVISION GRINDING WHEEL INSTITUTE MEMBER TIFFIN OHIO

A COMPLETE LINE

If you have been buying only one or two CMD products such as slip jackets or core trays, you may not realize that we also furnish many other supplies for foundries.

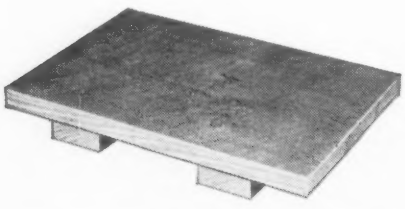
CMD NON-BURN SLIP JACKETS

CMD FOUNDRY SPECIALTIES

CMD PNEUMATIC CORE TRUCKS

Pneumatic tires and CMD inner coil spring construction in the upright supports completely absorb bumps and jars before they reach the cores. No chafing! No breakage! There's a CMD Pneumatic Core Truck exactly right for your needs.

Model A-27 (illustrated above) is available in the following sizes: 27" x 60"—1,000 lbs. cap.; 27" x 72"—1,200 lbs. cap.; 27" x 84"—1,400 lbs. cap.



CMD WOOD BOTTOM BOARDS
All sizes and shapes

INCLUDE:

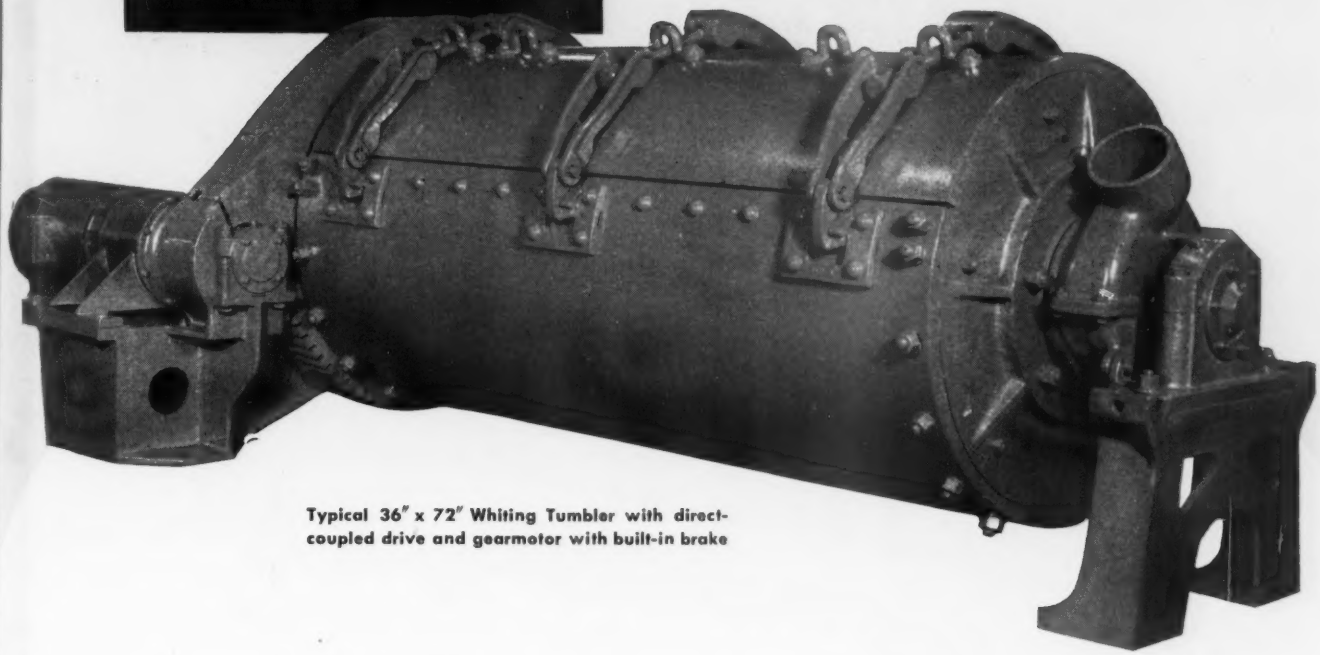
- Wood Floor Flasks
- Cross Bars
- Wood Wedges
- Bottom Boards
- Slip Jackets
- Hand Riddles
- Crucible Skimmers
- Core Trays
- Slag Skimming and Rabbling Irons
- Chipping Hammers
- Air Separators
- Bag Holding Trucks
- Pneumatic Core Trucks
- Pneumatic Core Barrows
- Resilient Rack Core Trucks

Write Dept. 3-F For Free Circulars

on CMD foundry equipment and specialties including complete specifications and price list.

CHICAGO MANUFACTURING & DISTRIBUTING CO.
1928 West 46th Street **Chicago 9, Illinois**

A RUGGED MILL FOR A TOUGH JOB



Typical 36″ x 72″ Whiting Tumbler with direct-coupled drive and gearmotor with built-in brake

Experience has taught us the importance of rugged construction when it comes to a tumbling mill. Heavy plate shell, roller bearings, steel trunnions, proper alignment of barrel, smooth meshing gears, reinforced tight-fitting door—all these are important features of Whiting design that insure long life and low-cost operation.

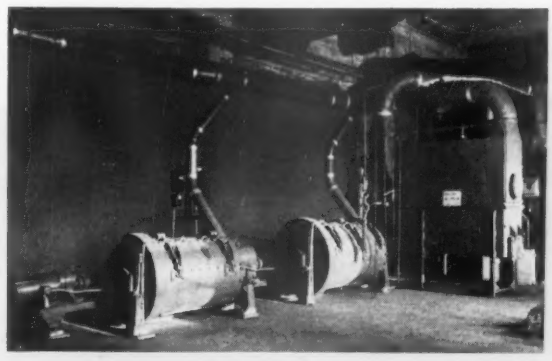
Standard sizes: 24″, 30″, 36″, 42″, and 48″ diameter—in lengths from 36″ up. Special designs for special needs. Various types of direct drive, also line drive when desired.

Bulletin FY-123R gives full details, or ask the Whiting sales office nearest you.

WHITING
CORPORATION

15607 Lathrop Ave. Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Representatives in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church St., New York 7, N. Y.



These two Whiting Tumbling Mills are served by a Hydro-Clone Dust Suppressor

to be sure

LAYNE and BOWLER, Inc. uses FEDERATED BRONZE INGOT

Layne and Bowler, Inc., Memphis, Tennessee, prominent manufacturer of industrial turbine pumps and water supply systems, uses Federated bronze ingot to cast the impellers of all its pumps.

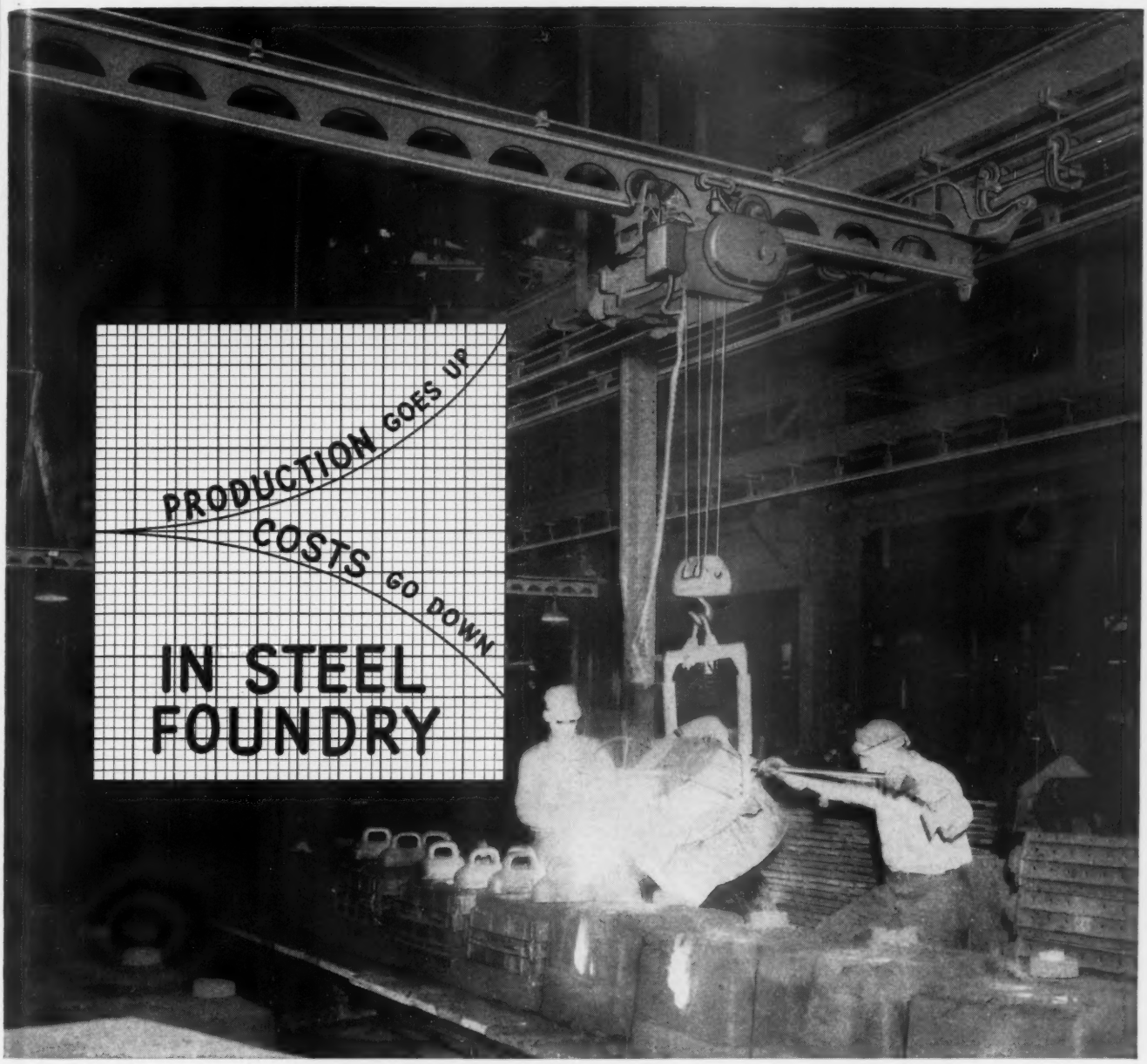
The company claims that the metallurgical quality of the particular Federated alloy used is outstanding, and that it consistently delivers the high tensile strength required in a part subject to severe stress.

In over 50 years as a manufacturer . . . and 20 years as a Federated customer . . . Layne and Bowler has learned that superior metal means superior castings. You, too, can be sure of the best in non-ferrous metal and in technical foundry help when you see Federated first.

Federated Metals Division

Federated first in the non ferrous field FMD

AMERICAN SMELTING AND REFINING COMPANY • 120 BROADWAY, NEW YORK 5, N. Y.



When a large Steel Foundry installed an overhead Cleveland Tramrail system to serve its pouring floor two significant things happened: (a) production increased greatly, (b) costs went down.

Factors contributing to these results were:

1. Enabled use of larger pouring ladles
2. Provided efficient working routine
3. Reduced delivery time of metal to molds
4. Decreased heat loss in metal
5. Eliminated much hand lifting, lugging and hard labor
6. Minimized worker fatigue
7. Promoted safety

Because of the phenomenal success with the pouring floor installation, Cleveland Tramrail was installed in other departments with equally remarkable results. In nearly every instance the equipment paid for itself within the first six months of operation.

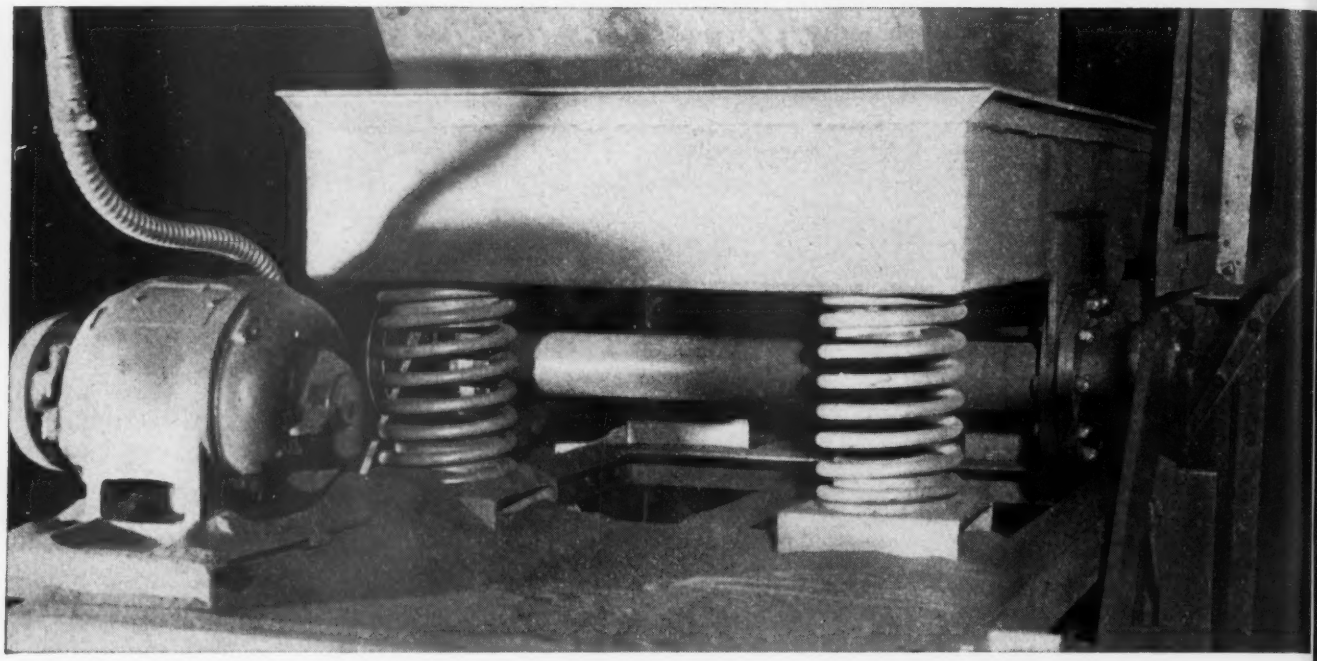
GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3804 East 286th St. Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

HEWITT-ROBINS PRESENTS THE Vibra-Feeder®



The First Simple, Practical, Low-Cost Fully Mechanical Vibrating Feeder

Finally . . . a practical vibrating feeder that is *fully mechanical!* The new Hewitt-Robins Vibra-Feeder performs as well or better than the most expensive feeders, yet *its only electrical is a light-duty plug and receptacle,* and its current draw is as little as *2 amperes!*

Just look at all the ways the Vibra-Feeder saves you money, not only in initial cost but in installation, operation, maintenance and replacement parts:

No Extras—Initial cost covers *everything you need* for complete installation, including motor, V-belts, sheaves, cable and all other accessories.

Easy to Install—Your own maintenance personnel simply bolt the Vibra-Feeder to whatever base you have available—or suspend it wherever desired. Hook the motor to the line and it's ready to go to work!

Easy to Operate—Just push a button and start loading. The Vibra-Feeder *cannot be overloaded* because it's fully mechanical . . . *will not bog down . . . will feed consistently under any load!* Once set for your particular load, you can forget about it.

Low-Cost Replacement Parts—The only moving parts are in the vibrator itself. They're simple in form, low in cost, easily serviced by your maintenance crew. And remember, no costly control boxes, tubes, motor generators, etc. to repair or replace!

Negligible Maintenance—Only two points to lubricate—both on the vibrating mechanism. What little maintenance there is, can easily be done by your own shop personnel.

Fully Mechanical Vibrator—Very simple in construction . . . just four bearings and an eccentric shaft. Vibrator is fully mechanical, completely dust-tight, impervious to heat and cold, practically noiseless!

Wide Range of Sizes—Available from 24" to 48" wide and 48" to 96" long, with other sizes to meet your precise specifications.

The Vibra-Feeder is another Hewitt-Robins "first" in the materials handling field . . . another example of the way Hewitt-Robins can save you time, trouble and money, no matter what you have to move. For complete details, write for Bulletin 134, Robins Conveyors Division, Passaic, New Jersey.

A MECHANIZED FOUNDRY — MEMBER FEMA FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. — BENEFITS EVERYONE

HEWITT-ROBINS

VIBRA-FEEDER

HEWITT-ROBINS INCORPORATED

BELT CONVEYORS (*belting and machinery*) • BELT AND BUCKET ELEVATORS • CAR SHAKEOUTS • DEWATERIZERS • FEEDERS • FOAM RUBBER PRODUCTS • FOUNDRY SHAKEOUTS • INDUSTRIAL HOSE • MINE CONVEYORS • MOLDED RUBBER GOODS • RUBBERLOKT ROTARY WIRE BRUSHES • SCREEN CLOTH • SKIP HOISTS • STACKERS • TRANSMISSION BELTING • VIBRATING CONVEYORS, FEEDERS AND SCREENS

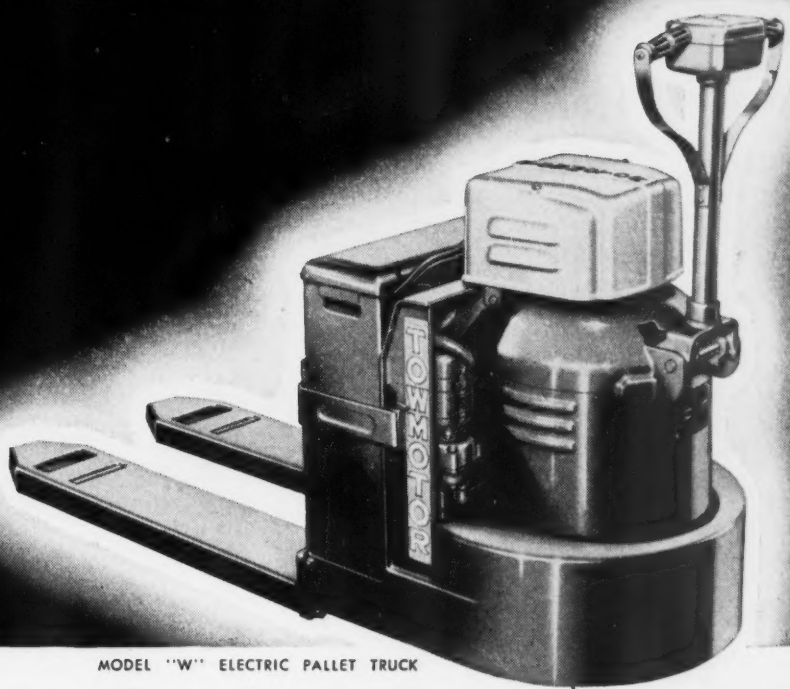
fast, agile, highly maneuverable • outstanding design

compact, rugged construction • touch-button control

transports 4,000-lb. loads • smooth hydraulic lift

positive-action brake • raises heavy loads rapidly

dual rubber trailer wheels • powerful electric drive



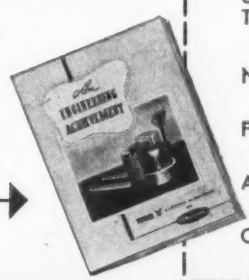
MODEL "W" ELECTRIC PALLET TRUCK

See the
TOWMOTOR EXHIBIT
BOOTHS 322-323
1951 MATERIALS HANDLING EXHIBITION
International Amphitheatre
Chicago, April 30—May 4

TOWMOTOR GIVES YOU

more features

Any way you look at it, the Towmotor Model "W" Electric Pallet Truck is an engineering achievement packed with cost-cutting features for fast, safe, easy handling of loads up to two tons. Its great versatility is being proved in every type of manufacturing. Learn how this efficient electric truck can help cut *your* handling costs. Write for the comprehensive booklet shown in coupon.



SEND FOR NEW BOOKLET

TOWMOTOR
THE ONE-MAN-GANG ®

FORK LIFT TRUCKS and TRACTORS
RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

TOWMOTOR CORPORATION, Division 75
1226 E. 152nd Street, Cleveland 10, Ohio

Please send the new free booklet, "AN ENGINEERING ACHIEVEMENT," giving complete cost-saving details of the Model "W" Electric Pallet Truck.

Name_____ Title_____

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Dust Control System on Rotary Breaker Screen and sand handling system in a casting plant of one of the nation's largest steel companies.

The large volumes of dust produced in the sand handling operations of this plant are not a problem. As soon as dust is formed, it is removed by the KIRK & BLUM Dust Control System.

One of the many KIRK & BLUM foundry installations, this Dust Control System meets every requirement of the American Foundrymen's Association code; heavy gauge piping has flanged joints and convenient clean-out doors.

Hundreds of plants, large and small, have found it pays in *greater operating efficiency* to have a dust or fume control system designed and installed by experts. For all three—design, fabrication and installation—call on KIRK & BLUM.

If you need a new dust control system . . . or more capacity in an existing one, contact KIRK & BLUM. They'll gladly prove the money-saving efficiency of systems by KIRK & BLUM, specialists in dust and fume control for more than 43 years. For Booklet, write The Kirk & Blum Mfg. Co., 2808 Spring Grove Ave., Cincinnati 25, Ohio.

One Undivided Responsibility
DESIGN...FABRICATION...INSTALLATION
For all three—call on K&B

FOR CLEAN AIR... THE INVISIBLE TOOL

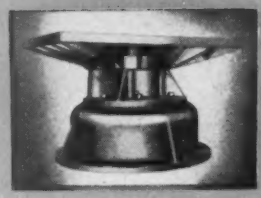
KIRK AND BLUM

DUST CONTROL SYSTEMS

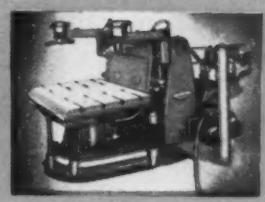
You can toot your own horn

WITH HIGHER QUALITY UNIFORM CASTINGS AT LOWER COST WHEN YOUR FOUNDRY IS EQUIPPED with

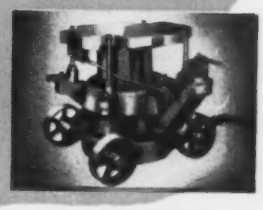
DAVENPORT FOUNDRY MOLDING MACHINES



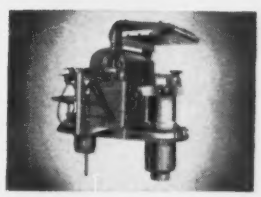
Plain Jolt
Model AJ-16



Jolt Rollover Draw
Model SA



Jolt Pin Lift
Model AJS (Portable



Jolt Rollover Draw
Model A

Jolt Squeeze
Model 10-JX (Stationary)

TOOT YOUR OWN HORN

Take a deep breath and toot your horn! You can reduce your costs—you can deliver uniform castings at a better price when you mechanize your foundry with Davenport molding machines.

Let us send you our catalog. It is worth your time.

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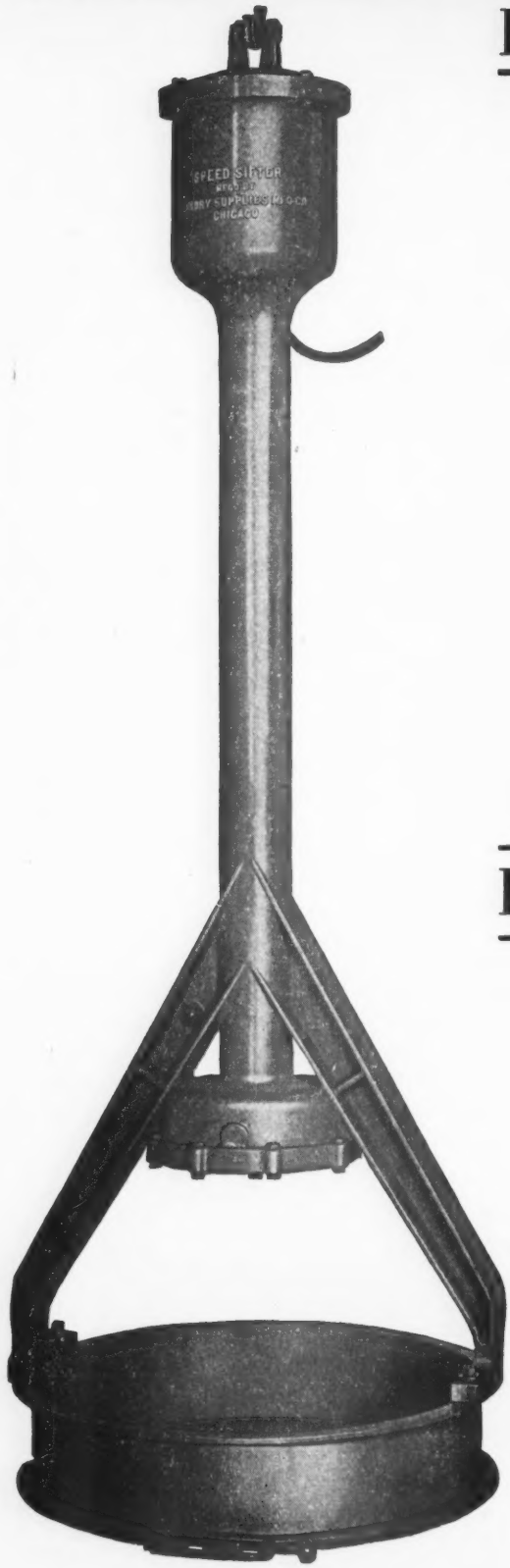
Increase Production

with the

ROTOPLANE SPEED SIFTER ★ RED ELECTRIC VIBRATORS



ROTOPLANE SPEED SIFTER

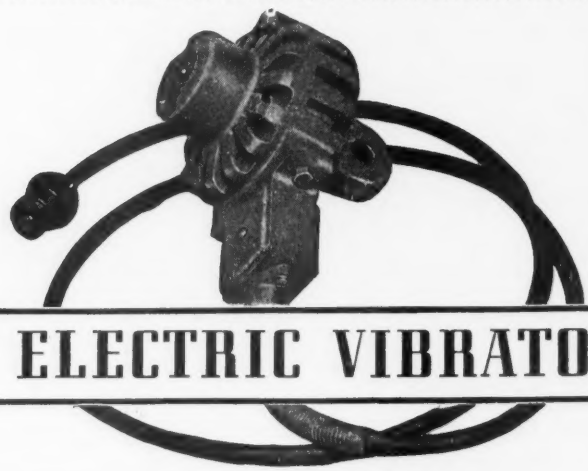
The ROTOPLANE Speed Sifter is an *improved* sand riddle of much greater capacity and much longer life. One size and type serves all purposes in the foundry—does *all* your sifting more quickly and economically.

It is easily handled by one man, weighs approx. 90 lbs. is 62 in. high overall. The one-piece frame of tough aluminum alloy makes for a remarkably effective vibration. Its smooth, free, rotary action vastly increases bearing life; all bearings grease packed. All mechanism of the ROTOPLANE is *completely* enclosed—no bearings or activating parts of any kind exposed to dust and grit.

The Quick-Change Sieves are instantly interchangeable, mounted in smooth, flat steel ferrule, with 20-inch diameter clear sifting area. No jagged edges to tear workers' hands, no storage problem.

$270.00 f.o.b. Chicago—complete with cable, safety ground wire. Standard 1/3 h. p. motor, 110 volt, 60 cycle, single phase and 220 volt.

UNIVERSAL FREE - WHEELING RIDDLE equipped with motor as above $245.00



RED ELECTRIC VIBRATORS

True-to-pattern castings make satisfied customers . . . more repeat business. Increase your production and castings quality with RED Electric Vibrators. Sturdy, dustproof, lowest operating cost (electricity does not freeze). Unequaled for consistent year-'round results in foundries all over the world.

(All Prices f.o.b. Chicago)

No. 1—Light match plate work	$11.00
No. 2—Medium match plate work	13.00
No. 5—Heavy match plate, tub and bench work	17.00
No. 9—Machine and heavier work	26.80

Third (ground) wire per U. S. Govt. code—furnished with No. 9 at no extra cost; $1.20 extra with Nos. 1, 2 and 5 vibrators.

KNEE SWITCHES for operating Red Electric Vibrators: Single pole $5.00, Double pole $6.50.

FOUNDRY SUPPLIES MANUFACTURING CO.

2221 Orchard Street **Chicago, Illinois**

CABLE ADDRESS: "ROTOPLANE CHICAGO"

2 Good Ways to Reduce Non-ferrous Cleaning Room Costs!

Use NORFLEX WHEELS for Removing Gates and Risers

(1) Sturdy, yet flexible NORFLEX Wheels are reducing non-ferrous cut-off costs everywhere because they're strong and safe and will withstand considerable sidegrinding, twisting and bending.

(2) Although great strength and flexibility are outstanding features of NORFLEX Wheels, they cut fast, often faster than conventional cut-off wheels.

(3) Because NORFLEX Wheels often last four to six times longer than conventional wheels—with practically no danger of breakage—fewer wheel changes are necessary, and a substantial saving in labor cost, grinding wheel expense and grinding time is possible.

and CRYSTOLON WHEELS for Removing Excess Metal

CRYSTOLON Wheels, especially designed for grinding non-ferrous castings, feature a fast, smooth cutting action insured by strong, sharp CRYSTOLON abrasive and filler treatments which prevent wheel loading.

Their extra long life is insured by special B-5 and B-7 resinoid bonds for high speed wheels and by vitrified bond for slow speed wheels. They are available in a variety of sizes and shapes to fit all standard bench, floor stand and portable grinders.

Why not arrange for a trial with your Norton abrasive engineer or distributor?

W-1258

NORTON ABRASIVES

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Warehouses In Five Cities — Distributors In All Principal Cities
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"I've discovered the newest way to cut refractory costs!"

IT'S NEW

B&W ALLMUL

...the economical fused-mullite firebrick

WHAT IS ALLMUL? B&W ALLMUL Firebrick is composed of practically all tough, massive, interlocking mullite crystals produced in the electric furnace. It has an unusual combination of excellent refractory properties: *high hot load strength, high resistance to spalling, good volume stability and a high melting point of 3335 F.*

B&W ALLMUL costs *far less* than any similar refractory. ALLMUL is designed to slash refractory costs by eliminating the frequent need for furnace relining. In fact, ALLMUL Firebrick will give you a new standard of economy and performance in furnace construction and operation. Already, B&W ALLMUL is being used in such diverse applications as hot metal mixers, glass tanks, electric melting furnaces, burner tile, butt weld furnaces, and many others.

If you are now using fused-mullite refractories, you will be surprised by the low cost of ALLMUL . . . at the savings you can make with this top quality refractory.

If you have always thought fused-mullite refractories cost more than you can pay, economical B&W ALLMUL is well worth investigating.

NEW BULLETIN!
Gives all the facts about ALLMUL Firebrick. Just clip coupon and mail today.

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☐ *Please send a copy of your new bulletin on ALLMUL Firebrick.*
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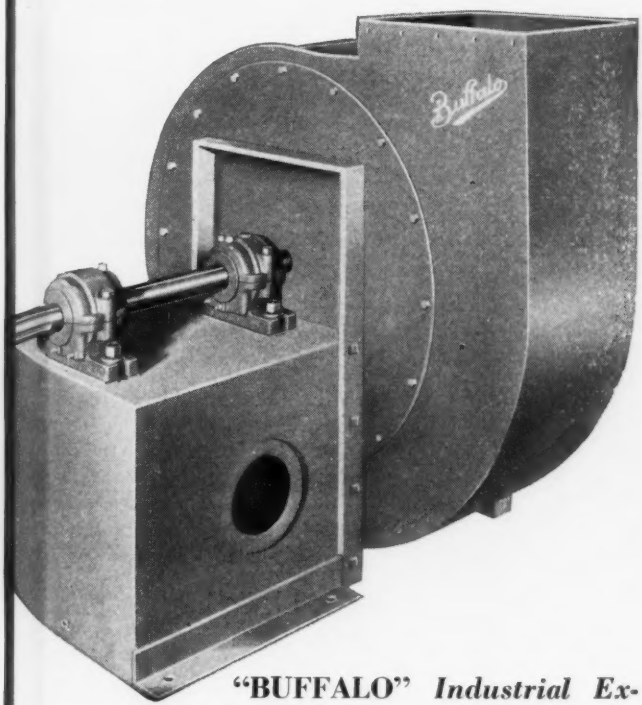
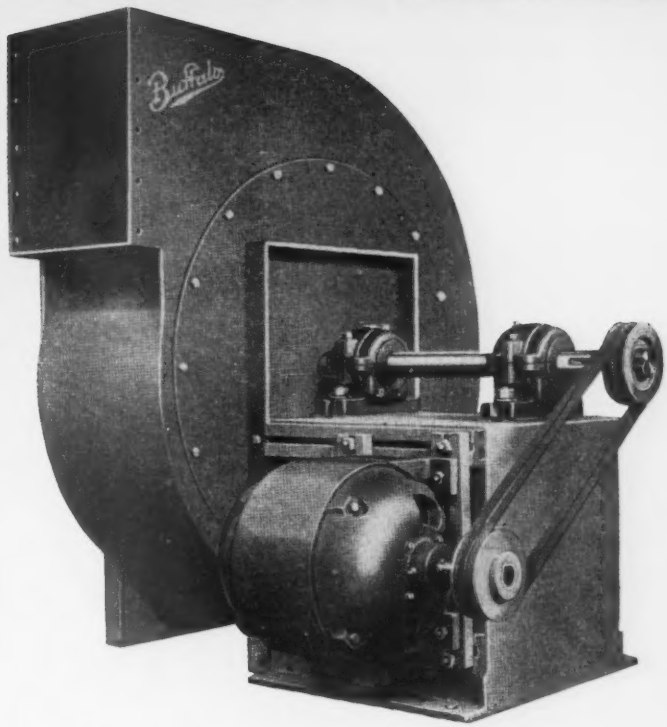
EXHAUST THE *AIR* YOU *DON'T* WANT

—WITH "BUFFALO" TYPE "AW" INDUSTRIAL EXHAUSTERS

● These all-welded steel plate fans are extremely rugged for heavy duty, and their smooth wheel and housing surfaces have no rivets to add to resistance. Housings of "Buffalo" Industrial Exhausters are readily adjustable to any desired discharge position. Models available for hot or corrosive gases. Type "AW" Wheels have blades shaped for high efficiencies.



"BUFFALO" *Industrial Exhauster with 6-bladed "MW" Material Wheel. Both "AW" and "MW" Wheels are interchangeable.*



"BUFFALO" *Industrial Exhausters are available in four arrangements, both belted and direct drive.*

MOVE MATERIALS ECONOMICALLY

—WITH "BUFFALO" TYPE "MW" INDUSTRIAL EXHAUSTERS

● If you can move it with a pneumatic system, chances are "Buffalo" Industrial Exhausters are your cheapest method! Emery dust, chips, etc., handled efficiently. "MW" Wheels have rugged blades welded to back plate—will out-perform paddle wheel type wheels. WRITE FOR BULLETIN 3576-A for any exhausting problem you may have.

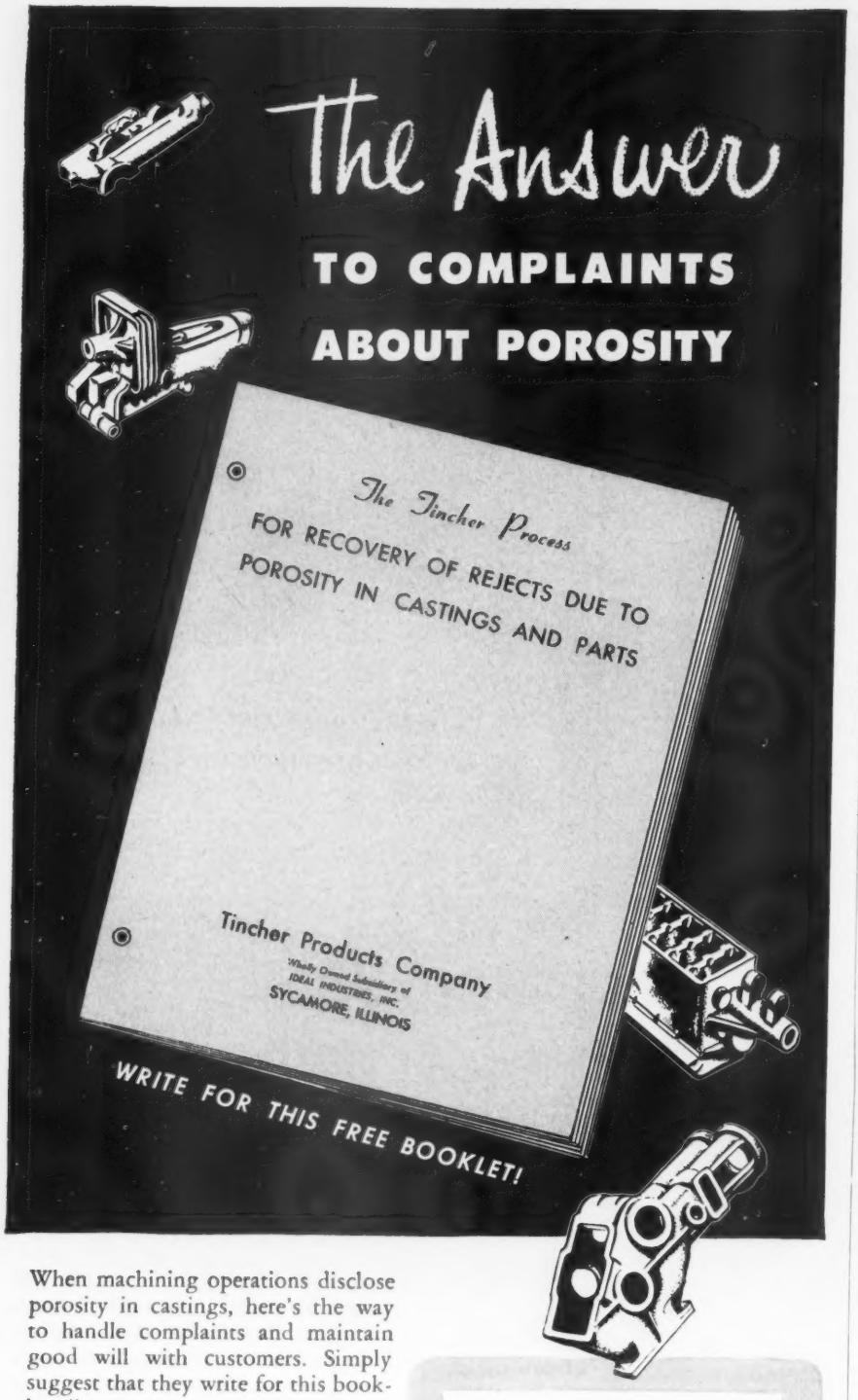
"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

221 MORTIMER ST. BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont., Branch Offices in all Principal Cities

VENTILATING FORCED DRAFT | AIR WASHING COOLING | AIR TEMPERING HEATING | INDUCED DRAFT EXHAUSTING PRESSURE BLOWING



When machining operations disclose porosity in castings, here's the way to handle complaints and maintain good will with customers. Simply suggest that they write for this booklet, "THE TINCHER PROCESS." It explains, in concise question-and-answer form, how The Tincher Process converts rejects due to porosity into perfectly sound castings.

The Tincher Process is thoroughly tested and proved. Leading manufacturers everywhere (names on request) have employed it for many years not only to seal porosity, but also to permanently mend fractures and fill voids in castings, thus reducing the number of rejects to an absolute minimum.

Helping your customers save castings will help your own business, so write today for a sample copy of the booklet, "THE TINCHER PROCESS."

TINCHER
PRODUCTS COMPANY
842 Borden Avenue
SYCAMORE, ILLINOIS

Wholly Owned Subsidiary of Ideal Industries, Inc.

Readers' COMMENT

Approves of Editorial

TO THE EDITORS:

I think the editorial in the February issue of FOUNDRY is exceptionally good and my only criticism would be that it is perhaps not strong enough. From reading the remarks of the Attorney General, one would suppose that our government is something apart from the citizenry that goes to make it up. I hope the Attorney General (and a few hundred assistants) will read the editorial and wake up to the fact that business men are not criminals at heart and that it would serve our country well, in this emergency, if they would drop the miserable attitude they have expressed toward Industry Advisory Committees.

I want to compliment you on the news report which you have incorporated as a new feature in FOUNDRY. It is a quick review of items which are really useful to me in my work.

Sincere best wishes for the continued success of your publication.

LOWELL D. RYAN
Managing Director

Malleable Founders' Society
Cleveland 14, *O.*

* * *

Gas Utility Aids Foundries

TO THE EDITORS:

I read your magazine with great interest every month. In the current issue, February, on page 126 there is an item in "Foundry Developments" on which I would like to comment. I refer to the paragraph which states that a large producer of fuel oils, etc., is making available to industry a service which answers questions regarding the efficient use of fuel in foundries.

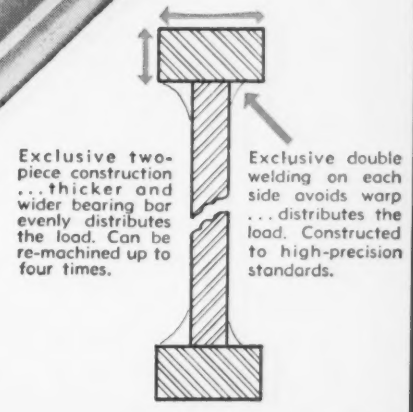
For your information, also for publication if you see fit, I would like to remark that in most large cities where foundries are located the local gas utility also maintains a similar service. In the territory served by my company, for example, there are many nonferrous metal foundries using gas for melting, core baking and other miscellaneous processes. We sell manufactured gas with a heat content of 540 Btu per cubic foot at rates which make it more expensive, on a Btu basis only, than oil or coke.

(*Continued on page* 78)

TARGET FOR HARD KNOCKS

...how long can a flask stand up?

If you mean BS&B Heavy Duty Welded Flasks, the answer is "twice as long." Exclusive double welding and two-piece construction overcomes warping and cracking. Rock 'em and sock 'em even in mechanized production lines ... they'll stay on the job and beg for more!



Exclusive two-piece construction ... thicker and wider bearing bar evenly distributes the load. Can be re-machined up to four times.

Exclusive double welding on each side avoids warp ... distributes the load. Constructed to high-precision standards.

BS&B

Fabricated Steel

FOUNDRY FLASKS

BLACK, SIVALLS & BRYSON, INC.

Sales Promotion Dept. **Section 1-10-3FF**

7502 East 12th Street **Kansas City 3, Mo.**

BLACK, SIVALLS & BRYSON, INC.

BLACK, SIVALLS & BRYSON, INC.

Sales Promotion Dept. **Section 1-10-**

7502 East 12th Street **Kansas City 3, M**

• We want more information about BS&B Flasks. Send your free "Foundry Flas Bible" complete with data, illustrations, hints and prices. ☐ Have sales represen tative call.

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FIRM_____

STREET_____

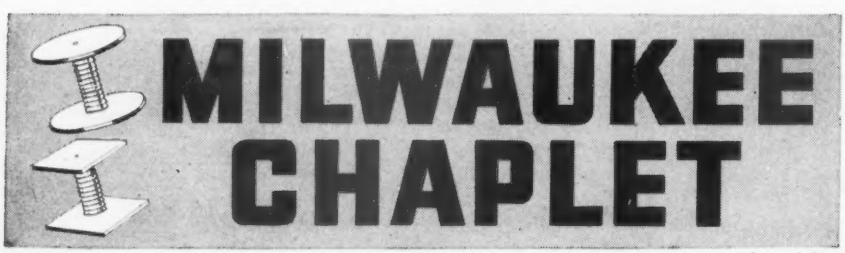
CITY_____ STATE_____

Originally developed to expedite the casting of motor blocks and heads, MILWAUKEE "Motor" Chaplets are now used extensively in producing light sectioned castings of all kinds. They are especially recommended for light castings which are to be subjected to gas, steam, oil or water pressure.

These light, double headed (square or round) Chaplets have the famous "MILWAUKEE Thread Stem" which permits the use of a *heavier stem* . . . resulting in the double benefit of a well secured core and a pressure tight casting. Scrap losses due to "leakers" are practically eliminated.

Milwaukee Motor Chaplets are available in plain, coppered or tinned finish; also in aluminum. Write for samples and prices, or refer to Page 9 of your Milwaukee Chaplet Catalog.

MILWAUKEE CHAPLET & MFG. CO.
1025 SOUTH 40TH STREET • MILWAUKEE 4, WISCONSIN



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(*Continued from page* 76)

We nevertheless find that gas is the preferred fuel in many foundries and one of the reasons for this is that we maintain a staff of engineers who devote a great deal of pains and care to the most efficient utilization of our fuel.

At no cost to our customer, we will take flue gas analyses, adjust burners for correct combustion to give the atmosphere required, advise as to possible recovery of waste heat, instruct operators on retunneling burners and maintaining linings in proper repair. Our people are trained to detect improper foundry practice; we have often been instrumental in improving over-all operations by cutting down stand-by losses and recommending pyrometric control to avoid overheating.

In this manner we maintain continued and expanding use of a high quality fuel. While I cannot speak for the entire gas industry, I am sure that you will find that the majority of large gas companies are prepared to render similar services. I only bring this subject up because the above practices and policies are of long standing with us. It is, therefore, interesting to note that a similar service on the part of our competitor is announced as news.

CARL WIERUM
Industrial Sales Manager
Brooklyn Union Gas Co.
Brooklyn 2, N. Y.

* * *

Reprints Not Available

TO THE EDITORS:

I have just read and thoroughly enjoyed the article on "Casting Design" by Clarence T. Marek appearing in the November issue of your magazine, FOUNDRY.

I will appreciate a reprint of this article if it available.

A. R. MARTIN
Light Alloys Ltd.
Renfrew, Ont., Canada

Editor's Note: Because the article by Professor Marek is from his book, "Fundamentals in the Production and Design of Castings," it is not possible to prepare reprints. The book may be obtained from the publisher or FOUNDRY for $4.

* * *

Changes Win Approval

TO THE EDITORS:

The January, 1951 issue of FOUNDRY is certainly a most pleasant surprise. We believe it is indicative of the growing interest and development now going on within our industry.

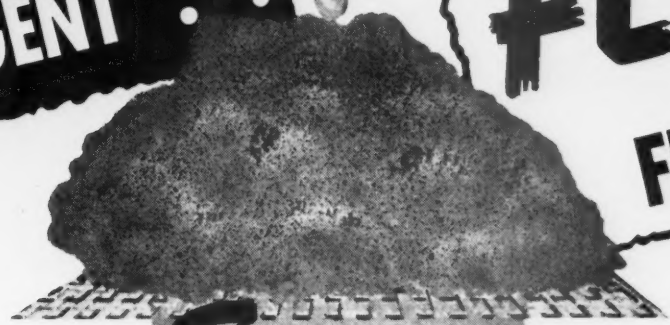
I don't want to slight any of the other refinements which are evident.

(*Concluded on page* 80)

DELTA 96·B SAND RELEASE AGENT . . .

Another Foundry "First"...by DELTA

MAKES SAND . . . FLOW FREELY



Easy AND *Economical* TO USE

By adding only 8 ounces or less of DELTA 96•B SAND RELEASE AGENT, per ton, to your core or molding sand mixes, your sands will flow freely . . . be easier to handle . . . easier to use. They will not stick to core boxes or patterns no matter how intricate they may be.

DELTA 96•B SAND RELEASE AGENT is the result of persistent research by DELTA Laboratories devoted to the discovery and development of a lubricant-dispersant for use in sand mixes. DELTA 96•B is a liquid which provides properties hitherto unknown in sand conditioning materials. It is completely volatile at elevated temperatures and does not contaminate the sand.

READ WHAT USERS SAY ABOUT DELTA 96·B SAND RELEASE AGENT

". . . . with the addition of 8 ozs. of Delta 96•B we are now able to blow cores we otherwise couldn't blow."

". . . . Delta 96•B gives the sand improved flowability. Our sand now works much more freely and leaves the core boxes clean."

". . . . and the trouble we had with sand sticking in the hopper, in the chute and on the conveyor has been eliminated with the use of Delta 96•B."

•

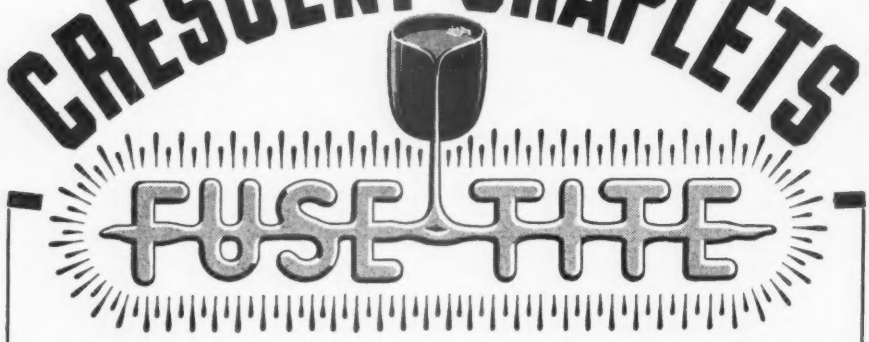
Prove it yourself in your own foundry. Ask for a test sample. No cost or obligation. You will also receive instructions for use. Write today.

DELTA OIL PRODUCTS CO.

Manufacturers of Scientifically Controlled Foundry Products

MILWAUKEE 9, WISCONSIN

CRESCENT CHAPLETS



If you don't see it here . . . . ask for it!

We manufacture a complete line of all types and sizes of Foundry Chaplets, and all kinds of wire and metal formations for your foundry use. If we don't already make what YOU need, we'll design and develop just the CHAPLET to suit your requirements. Your inquiries and specifications are invited . . . . for quick service, write for working samples. As a few of our specialties:

- **RADIATOR CHAPLETS**
- **SHOULDER CHAPLETS**
- **BOILER CHAPLETS**
- **DOUBLE HEAD CHAPLETS**
- **MOTOR CHAPLETS**
  (Regular or Extended stems)
- **TIN TUBES**
  (Plain or Perforated)
- **FOUNDRY NAILS**
  (Plain, Nicked or Barbed)
- **SKIM GATES**
- **CORE WIRES**
- **CORE PLATES and SHIMS**
- **TAPER DRIVE PLUGS**

CRESCENT FUSETITE CHAPLETS ARE MADE ACCURATE OF PROPER ANALYSIS MATERIALS FOR THE FUSING-IN PROCESS.

Being the Originators and Manufacturers of Radiator, Shoulder, Double Head and Motor Chaplets, Your Foundry benefits by our Chaplet Manufacturing experience since 1889 for the leading Stove, Radiator, Boiler and Motor Foundries.

We carry thousands of different types and sizes in stock for quick delivery, and have the facilities to make up special sizes promptly.

WRITE FOR SAMPLES AND PRICE LIST.

Crescent Brass & Pin Company

5766 TRUMBULL AVE.

DETROIT 8, MICHIGAN

(Concluded from page 78)

but one of the more interesting features to me is the page of foundry statistics. I do not doubt but that the maintenance of this feature will gradually reveal the growth and development as well as the shifting going on within the industry. It will also indicate the consumption of materials, and for this reason should help everyone in a better understanding of our importance. Within the industry it will be a constant reminder to look ahead and determine just how and where our raw materials are coming from.

GEORGE K. DREHER
Executive Director
Foundry Educational Foundation
Cleveland 13

●

TO THE EDITORS:

I would like to compliment you on the attractive appearance of the January FOUNDRY. I think that the artistic front cover treatment adds a further touch of dignity to a magazine that renders unique service to foundrymen everywhere.

CHARLES O. BURGESS
Technical Director
Gray Iron Founders' Society
Cleveland 14

* * *

Foundry Data Sheet

TO THE EDITORS:

I have just received my November issue of FOUNDRY and find pages 161 and 162, "Foundry Data Sheet," very interesting. I am referring to weight tables showing comparison of tons to gross tons and fractions. Would it be possible to have a copy of these tables mailed to me? I have use for both sides and would like to use them on my desk without having to turn them over.

S. LESTER WARMAN
The Pen Argyl Mfg. Co.
Pen Argyl, Pa.

* * *

Plastic Bonded Shell Molds

TO THE EDITORS:

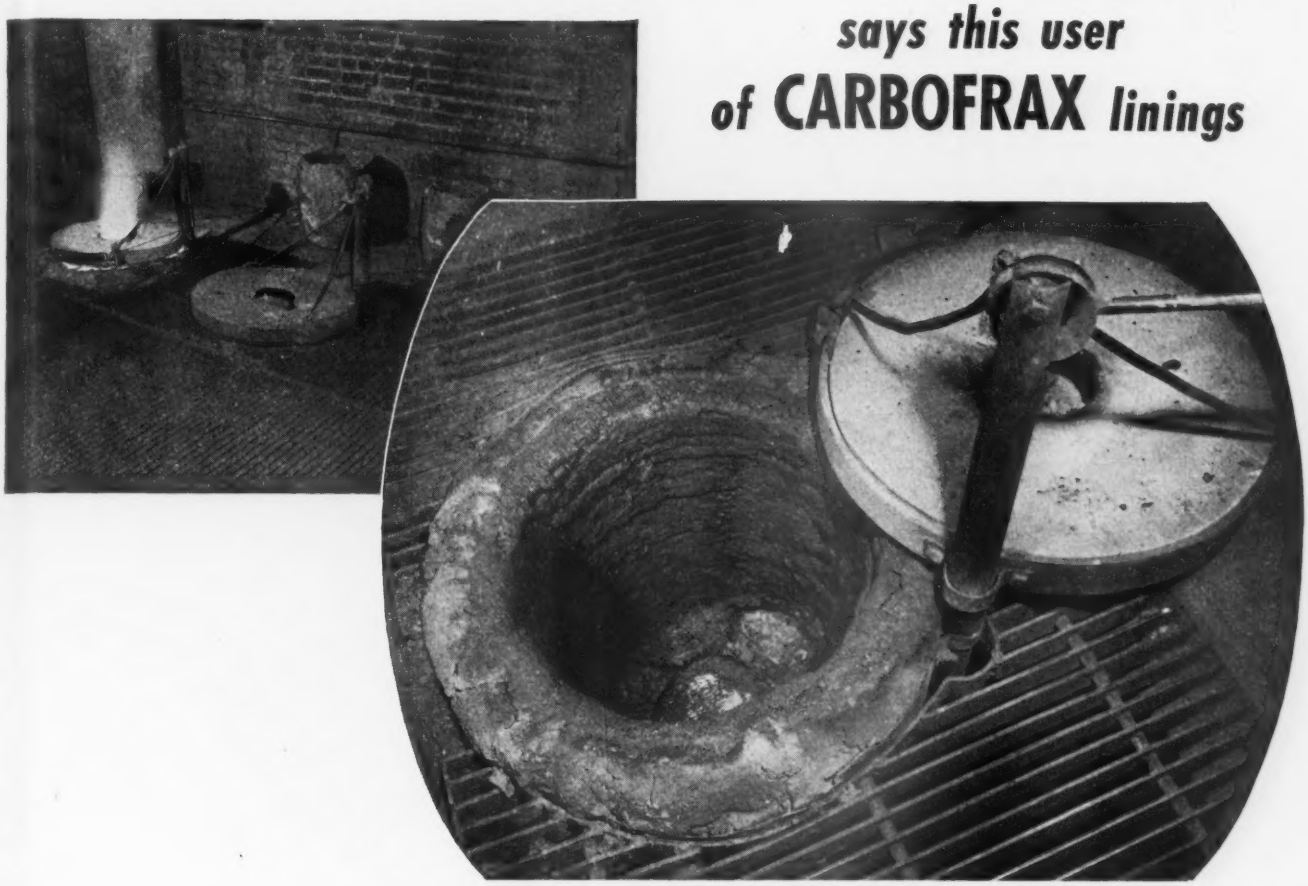
In the August, 1950 issue of FOUNDRY you published the article, "Plastic Bonded Shell Molds Used in New Casting Process," by Ames, Donner and Kahn of the Materials Laboratory of the New York Naval Shipyard.

I wonder if it would be possible to obtain four copies of this article, since it has excellent pictorial description of the process as well as a fine written description.

JOHN L. GOHEEN
American Brake Shoe Co.
New York 17

"Long life with minimum patching"

says this user of CARBOFRAX *linings*



These photographs were taken recently at the plant of a Pennsylvania brass company. The operator reports that the CARBOFRAX silicon carbide lining in this furnace, which has been pushed steadily, had gone 11 months at the time, and will give three to four months of service before complete relining is necessary.

This operator prefers CARBOFRAX cement No. 30. His furnaces take a No. 60 crucible, are fired with natural gas (two burners firing tangentially), and he gets five to six heats a day, mostly of brass and bronze compositions. (Under these conditions, the CARBOFRAX cement linings are giving him 14 to 15 months apiece.) The No. 30 cement is easily worked, and when installed and fired-in, gives a hard, durable lining that delivers a long life with minimum patching.

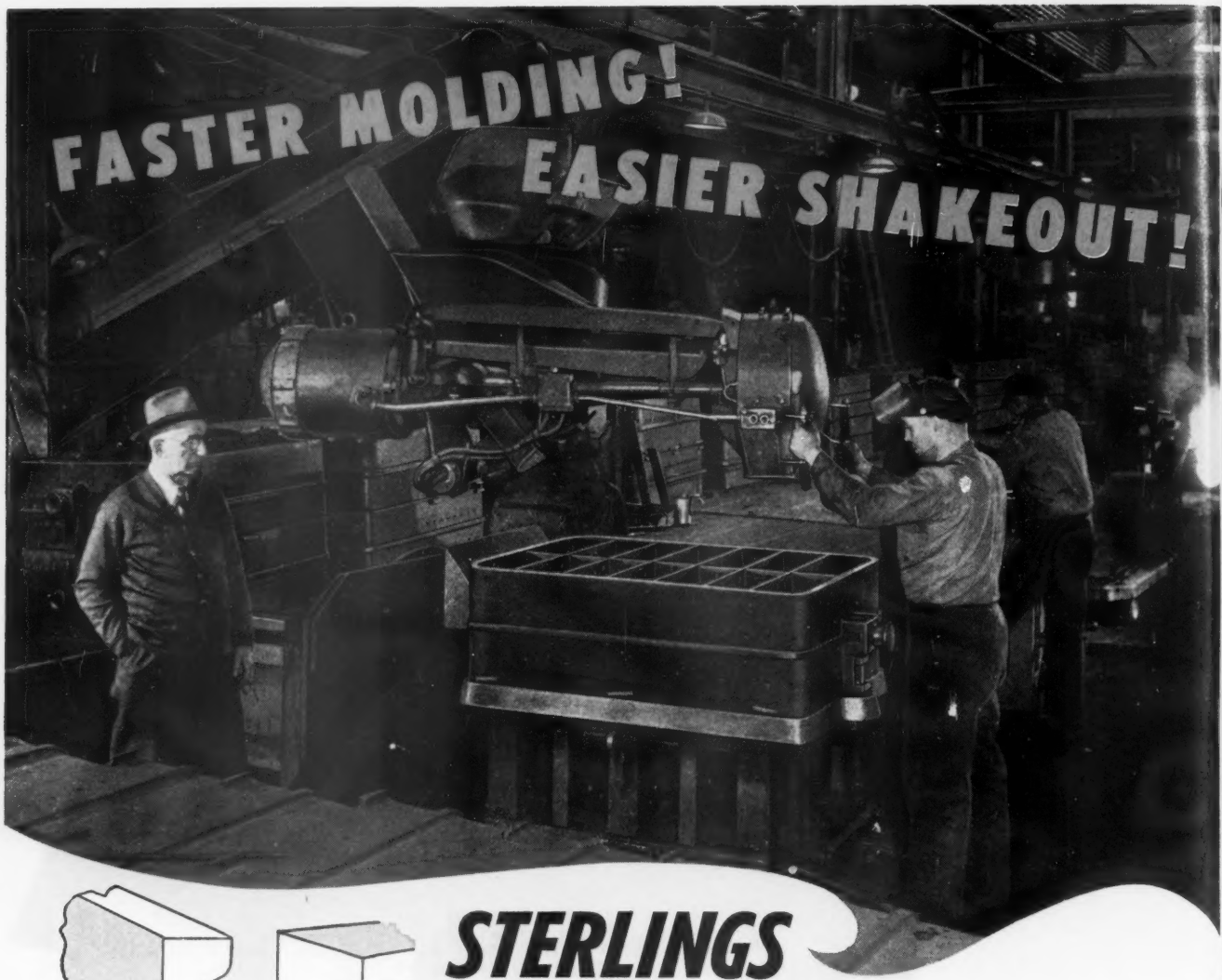
Other operators with different conditions prefer CARBOFRAX rings or ring segments. CARBOFRAX refractories in all three forms have exceptional resistance to flame erosion, spalling and cracking. The high refractoriness of the material eliminates any danger of the lining softening. Life is consistently long — production costs consistently low.

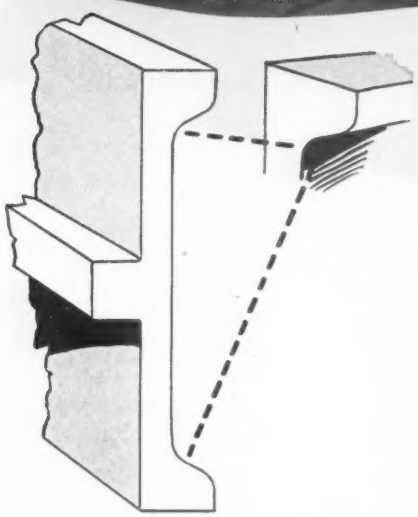
May we send you specific information on linings for your types of furnaces? If you will advise us of your operating conditions, we will be glad to furnish recommendations, design drawings and other pertinent information.

THE CARBORUNDUM COMPANY

Dept. A-31, Refractories Div. Perth Amboy, New Jersey

"Carborundum" and "Carbofrax" are registered trademarks which indicate manufacture by The Carborundum Company





STERLING ROLLED STEEL CHANNEL CONSTRUCTION

Heavy reinforcing rib around each section to resist torsional strains. Partings are machined square for full-width bearing. Note thick flanges. There's plenty of steel for several refinishings.

STERLINGS are Built for Tough Foundry Jobs!

You get faster molding . . . and a much easier shakeout with Sterling Steel Flasks. Fabricated from hot rolled high carbon steel and welded into one rigid unit, Sterling Flasks are ideal for high-speed foundry production. Even top speed sand slinger molding leaves no soft spot under the patented Sterling sandflange. Fillets eliminate sharp corners at top and bottom of both cope and drag. And flange will not curl under jolt action. Investigate the light weight and extra strength of Sterling Steel Flasks. Write today for your copy of Catalog No. 61A.

STERLING WHEELBARROW CO., Milwaukee 14, Wis., U.S.A.

Why is NPA So Exclusive?

VARIOUS government organizations established to handle mobilization of our resources for national defense appear to be suffering from growing pains. While orders restricting use of basic raw materials or otherwise controlling the activities of industry continue to pour out of Washington, the adverse effect of numerous actions on segments of industry frequently is not understood by the issuing agency. Since, at the moment, defense orders are not available in sufficient volume to take up the slack resulting from limitation orders, many companies—including foundries—will have great trouble in maintaining operations in the period ahead.

To avoid as much as possible the crippling effect of limitation orders on industry, government agencies might be expected to utilize every source of information and advice in setting up these restrictions. In many instances this is not being done.

Take, for example, the information that is readily available through the modern, well managed trade association. In the work of helping industry build a better product and enlarge the overall market, these organizations collect data covering such important information as raw material requirements, manpower needs, and available production capacity. Executive officers of these organizations probably are best informed on total needs of the industry and facilities provided by individual plants.

While many in government, especially those recently coming from industry, consult frequently with trade association executives, top brass in these agencies appears to hesitate on making best use of trade association data and service. As an example, the National Production Authority hedges on permitting association executives to sit in as observers at meetings of industry advisory committees, although members of such committees would appreciate having their association executives present. Lame excuses are offered, such as limitation on meeting space, lack of acceptable criteria for drawing a distinction among the many persons and groups interested in being present as observers, and inclination of committee members not to discuss problems frankly when surrounded by observers. Securing space and developing a formula governing attendance should not be difficult. Based on experience of Munitions Board foundry industry advisory committees, observers from government and industry do not prevent a frank discussion of the problems at hand.

The NPA points out that its "officials are encouraged to seek the information, help and advice which is available from organized non-government groups to learn the effect which its orders have on the industrial and business communities." This is all to the good.

But why not consult with these people before the orders are issued so that mistakes will be avoided and industry will not be handicapped because those writing the orders are not familiar with the peculiar problems of the industry?

Frank G. Steinbach
Editor

Casting Steel Crankshafts

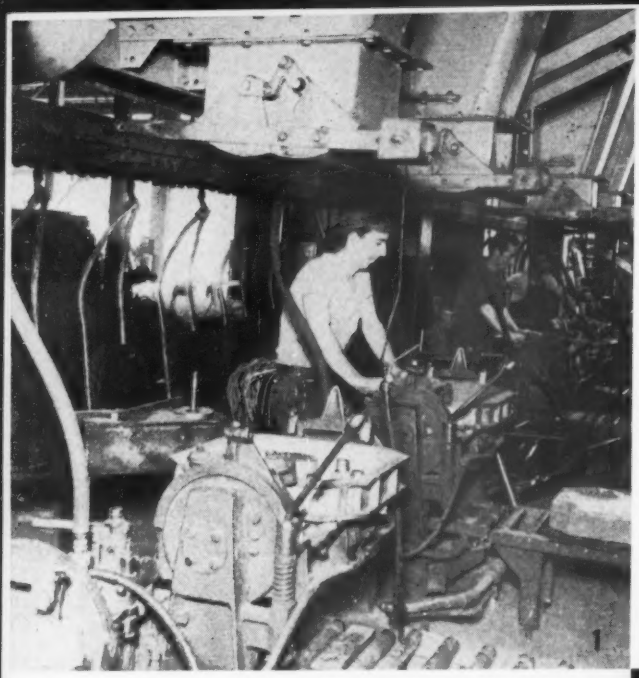


Fig. 1—Cores forming molds for crankshafts are produced on jolt-rollover molding machines located near the ovens

By EDWIN BREMER
Metallurgical Editor
FOUNDRY

Fig. 2—Molds on a conveyor line being filled with steel from large bottom-pour ladle

Fig. 3—View along mold assembly line when assemblage is nearing completion. Last step is placing of clamps

RIVERSIDE plant of Auto Specialties Mfg. Co., St. Joseph, Mich., was built in 1942 by Defense Plant Corp., at Benton Harbor, Mich., for production of 155-mm steel shells. These were cast using the slab core-mold practice similar to that developed for production of cast steel crankshafts. The plant was purchased by the firm in 1946 and converted to manufacture cast steel crankshafts for automotive and tractor use.

The foundry is housed in a brick and steel-sash building which is 530 ft long and 264 ft wide. All facilities, including storage of the various raw materials, are located under the one roof. As may be observed from the accompanying sketch of the floor plan, Fig. 9, the foundry is arranged for streamline flow, from raw materials arriving at one end of the building to the finished product leaving at the other.

Melting stock is steel scrap, foundry sprue and returns, and is kept in compartment storage bins occupying 44 x 132 ft and 25 x 44 ft. These are located just behind the electric furnace department. Material from the bins in approximately 50-50 ratio is picked up by a magnet attached to an overhead crane and dropped into a bottom-discharge, cylindrical container resting on a 20-ton capacity platform scale. This charging bucket has a capacity of 15 tons, and easily holds the usual furnace charge of 14 tons.

Equipment for melting comprises four direct-arc electric furnaces, each with a nominal rated capacity of 12 tons, but as previously indicated, the charges weigh 28,000 lb or 14 tons. Average melting time from power on to tap is 3½ hr. With three-shift operation the daily melt is about 210 tons. Furnaces are equipped with swinging roofs to permit top charging. As a consequence, charging is accomplished in minimum time as well as with the least fatigue of the operators.

To remove fumes and smoke arising from the melting operation ten 25,000-cfm capacity fans are mounted in the roof over the furnaces. Likewise nine 40,000-cfm fans are operated over the pouring section of the convevor lines located in the melting department and separated from the remainder of the foundry by a wall. Since the melting department, pouring line and storage facilities occupy an area of about 244 x 266 ft, with the roof about 58 ft high, it can be determined easily that with all the fans in operation, there is a complete change of air in those sections every 6 minutes.

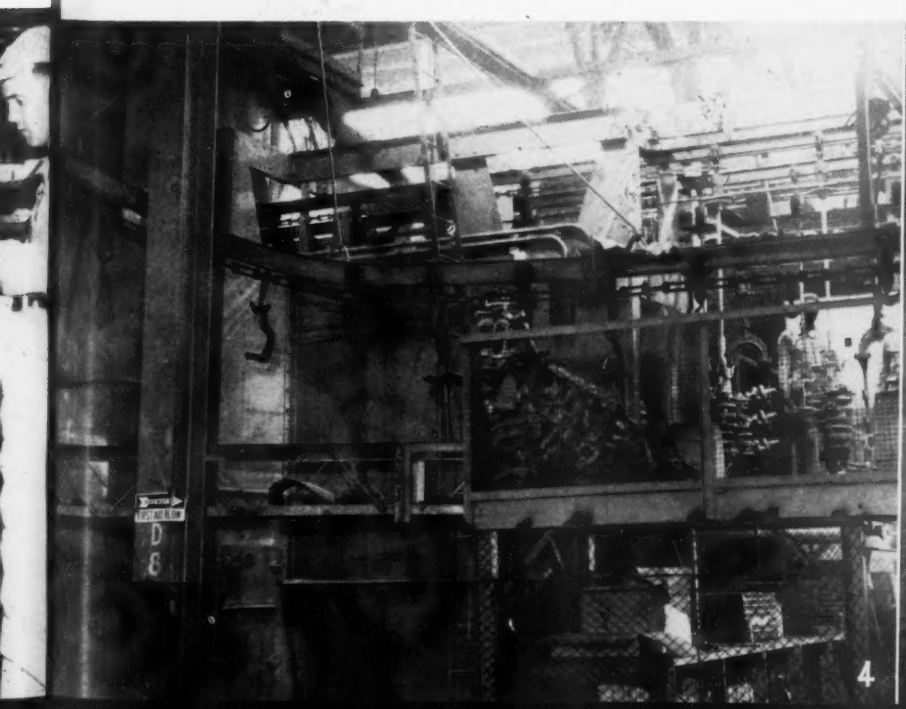
Molten steel containing 0.50 to 1.0 per cent Cu, 1.35 to 1.40 per cent C, 0.70 to 0.90 per cent Mn, 0.85 to 1.05 per cent Si, 0.45 to 0.55 per cent Ni and 0.13 to 0.18 per cent Mo is tapped into 8-ton capacity, bottom-pour ladles suspended from overhead cranes and taken to the pouring lines, Fig. 2, a short distance away. Each ladle will fill 20 to 25 molds depending upon whether they contain four-throw or six-throw crankshafts. Each mold holds four shafts.

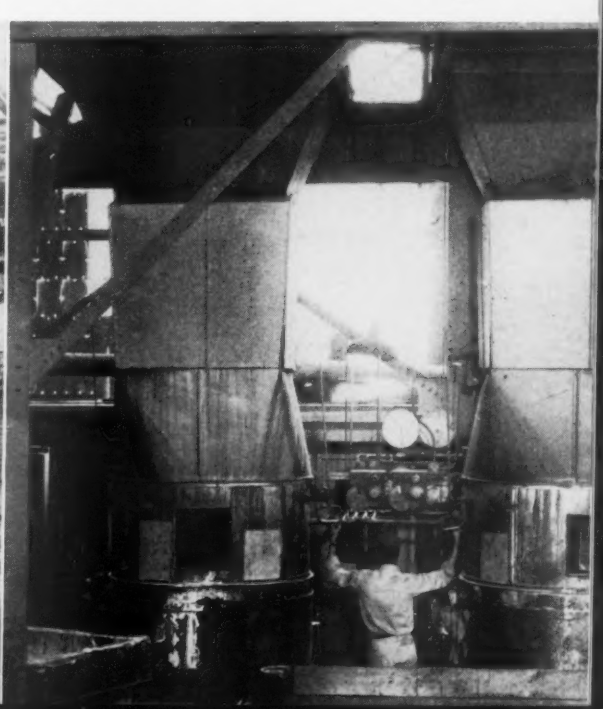
After the molds are poured they enter cooling tunnels where they remain about 8 hours. Slow cooling is required because the alloy steel employed is brittle, particularly in the hot state. On emerging from the cooling tunnel at the end of that time, the castings are removed from the molds. Since the mold sand at that point is quite friable, the mere lifting of the castings causes the mold to disintegrate, leaving the castings free from sand. Castings then are attached to hooks on a conveyor chain 2200 ft long which elevates them to the upper floor of the foundry where they make several loops, and descend in approximately 12 hours to the ground floor.

There the gates and risers are knocked off as shown in Fig. 8. The separated castings are hung on hooks attached to another chain conveyor which transports them through an automatic centrifugal-type shotblasting chamber, Fig. 4, which removes adhering sand and scale. Following shotblasting, the castings travel to the snagging department close by, Fig. 12, where gate and riser stubs and fins are ground

Fig. 4—Castings are conveyed through an automatic shotblastings chamber before and after heat treating

Fig. 5—Sand is mixed in mulling machines which are well ventilated and equipped with measuring devices





from the castings on any of eight double-wheel stand grinders or with portable grinders. Then the castings are again placed on the chain conveyor which transports them to either of two continuous-type roller hearth heat treating furnaces.

The furnaces are about 175 ft long divided into two approximately equal sections, and are electrically heated. In the first section the castings on alloy steel skids supporting the crankshafts in axial alignment at each main journal, are raised to a temperature of 1775° F in about 1½ hours, and held at that temperature for 3 hours. This treatment homogenizes the structure since in the as-cast state carbide envelopes surround the normal size cast grains. At the end of that period the castings have reached the exit of the first section of the furnace. They then are taken to straightening presses located a few feet away where the bearing portions of the crankshafts are aligned.

While it has been found that warpage or misalignment is minor, it has a decided nuisance value later on when the castings are checked for alignment of the crankshafts throws. Hence, it was decided to interpose the straightening operation while the pieces were still at high temperature—at the time when the heat treating cycle was interrupted to permit a still air quench to develop certain mechanical properties in the castings. Following the combined straightening and air quenching operations, the castings are placed in the second section of the furnace, reheated to 1450° F, and then allowed to cool slowly in the furnace at the rate of 50° F per hour until the temperature reaches 1200° F. Total cycle occupies about 8 hours.

After removal from the furnaces, the castings are hung on the chain conveyor which transports them again through the automatic shotblasting chamber for removal of any scale. Castings then are inspected, placed in fixtures to check alignment of the bearings and of the cheeks of the throws, and arranged in rows on wood skids holding 25 castings to which they are strapped for shipment.

As mentioned earlier the crankshafts are made in slab core molds with cavities for producing four castings attached to a single sprue. Number of slab cores required for a mold varies according to the number of throws on the crankshaft. In the case of the six-throw or six-cylinder shaft the number is 22, while 14 are used in making the four-throw crankshafts. Thickness of the various slab cores varies from 1½ to 5 in. to accommodate the different parting lines imposed by the design of the crankshaft, Fig. 6, as related to ease of production by the selected molding procedure. A complete mold for six-throw crankshafts is about 4 ft high, and that

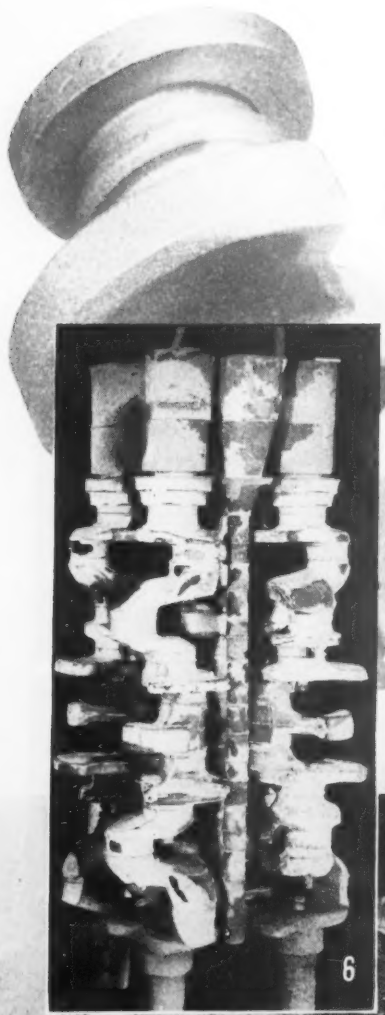


Fig. 6 — Common sprue carries metal to four crankshafts. Chills in bearings provide uniform freezing rates

Fig. 7 — Refractory surface on cores is obtained by dipping them in silica coating

Fig. 8 — After slow cooling on conveyor chain castings are separated from the sprues

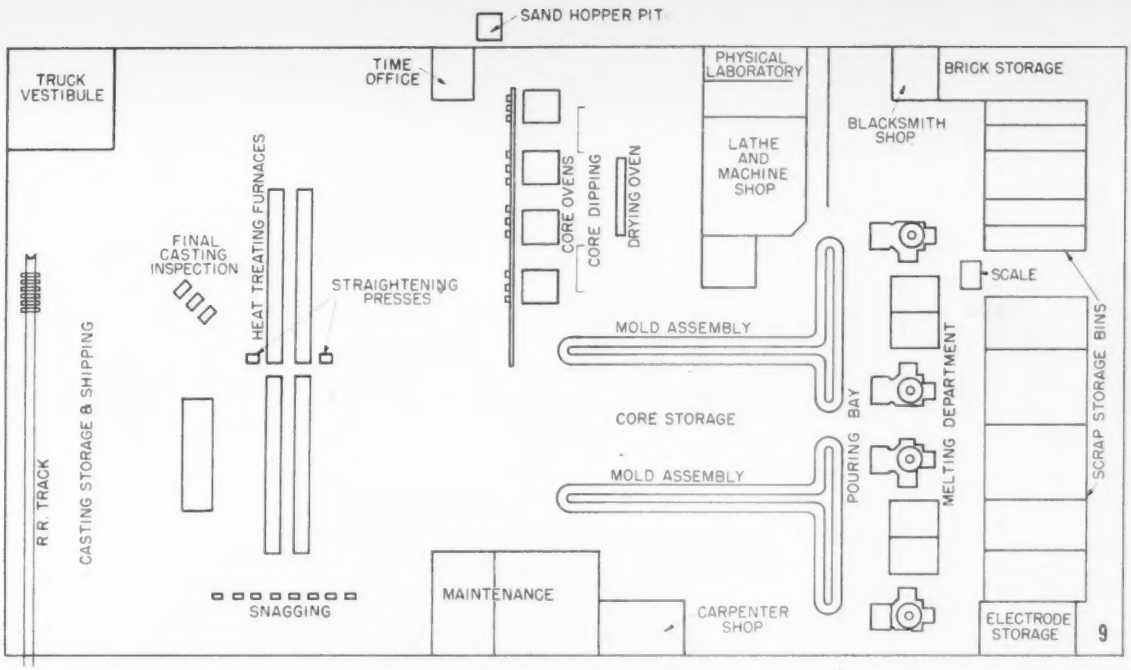


Fig. 9—Floor plan which shows general arrangement of operating departments and equipment. Wide use of car-type and overhead conveyor systems reduces handling to a minimum

for the four-throw type about 40 in. high.

Sand for the core molds is the well known Lake Michigan type with an average grain size of 50 AFS fineness standards. It is transported by truck to the foundry from dunes along the lake a few miles away. Approximately 200 tons of sand are used per day, and due to such factors as large available supply the year round, low cost of material and transportation and adequate means of disposal after use, no attempt at reclamation has been considered.

The truckloads of sand are dumped into a hopper located outside the foundry about midway along one wall from which it is elevated above the second floor. There it is discharged into a rotating kiln-type drier from which it falls into a 600-ton storage hopper. From the storage hopper the sand is discharged into any of three 2000-lb capacity mullers, Fig. 5, where it is mixed with about 1 per cent core oil, 1 per cent cereal binder and 2½ per cent water by weight. Practice is to mix the dry sand and dry cereal binder together for 30 seconds, then add the water and mix for 45 seconds, and finally add the oil and mix for 2 minutes. Tests on the various sand mixture properties are performed hourly in the sand laboratory.

From the mullers the sand is discharged onto a conveyor belt over the (*Please turn to page* 245)

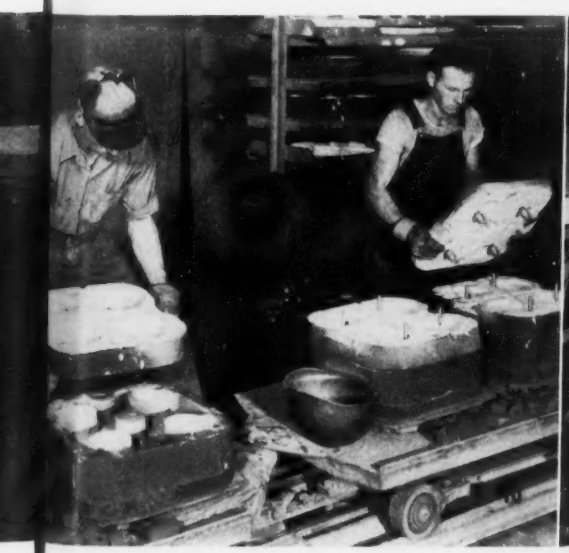


Fig. 10 — Beginning of mold assembly giving some idea of conformation of core sections

Fig. 11—After baking cores are taken from oven and set on an overhead conveyor

Fig. 12—Stubs of gates and risers are snagged off after castings have been cleaned

Pyrometry *in the Nonferrous Fo*

By ROBERT A. COLTON
Research Department
American Smelting & Refining Co.
Barber, N. J.

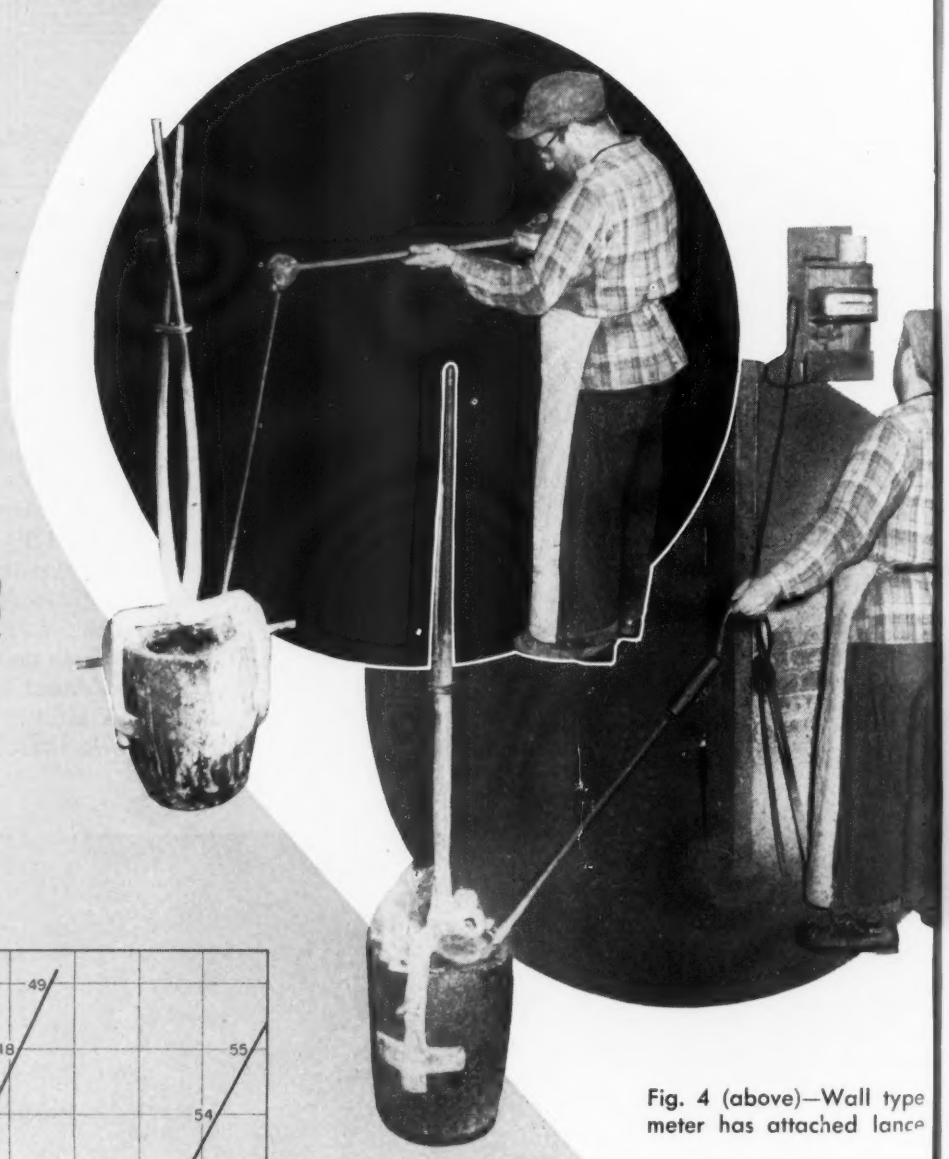


Fig. 3 (right) — Reading metal temperature with a portable type pyrometer

Fig. 4 (above)—Wall type meter has attached lance

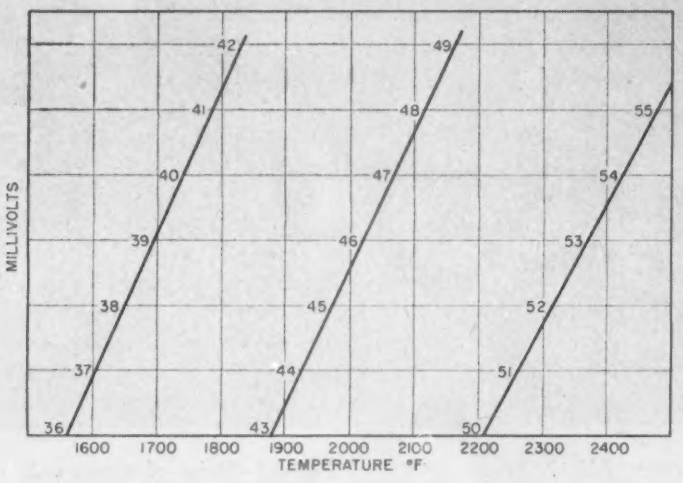


Fig. 5 (left)—Typical calibration curve for chromel-alumel thermocouples

In this second and concluding article the author describes the different types of instruments for measuring the temperature of molten nonferrous metals. Recommendations also are offered for the care and use of pyrometers

Foundry

IT IS ASSUMED that having read the first installment of this article (January FOUNDRY) the average foundryman is convinced that it is worthwhile to measure the temperature of the metal before pouring it into the mold. Many foundrymen will be tempted to point out that they have been convinced of this fact for some time but have found the carrying out of temperature measurement much more difficult than agreeing to its necessity. The second question asked by foundrymen is, "What is the best type of pyrometer to use in the nonferrous foundry?"

A number of different devices have been used for measuring temperatures of molten metals. Among these are the radiation pyrometer, which makes use of a sensitive element that is affected by the amount of heat radiated from a metal surface; the optical pyrometer which depends on the color of the surfaces of a bath of molten metal, and the thermocouple. Of the three devices the thermocouple is by far the most widely used in nonferrous foundries. The other two types of pyrometers have special applications and can be used more advantageously in the iron and steel foundry than in the brass foundry, especially where the metal is melted in crucibles.

The thermocouple is essentially two dissimilar wires joined together at one end, with the other ends leading into some sort of an indicating device. Its operating principle is called the thermo-electric effect and depends on the fact that if two dissimilar wires are joined together at both ends and one junction is heated, a voltage or electromotive force is generated in the circuit. The simplest form of pyrometer consists of a millivoltmeter which measures the voltage produced in the circuit connected to two wires of different metals, the ends of which are joined together and placed in the metal or furnace where the temperature is to be measured. The two wires are called the thermocouple and the millivoltmeter is merely an instrument for detecting the voltage produced in the wires.

The two dissimilar wires used most commonly in thermocouples and pyrometers employed in brass or aluminum foundries are chromel and alumel, which are complex alloys. Composition of these wires must be controlled carefully because the thermoelectric characteristics of the materials depend upon the compositions. Having standardized on the composition it is possible to make up thermocouples of these materials and measure the voltage produced by any particular temperature, then plot this voltage against temperature to produce a calibration curve as shown in Fig. 5. A standard curve of this type permits measurement of the temperature of a molten metal bath by determining the voltage produced in the thermocouple and referring to a standard curve to read off the temperature. Since that technique would be cumbersome, instruments have been developed by which this voltage is translated directly into temperature, so what actually is measured is the temperature of the metal directly. A number of methods will accomplish this operation.

In the nonferrous foundry two types of pyrometers are normally used. The two general classifications are those using millivoltmeters for measuring the voltage in the circuit of the thermocouple or those using potentiometers to measure the same value. Millivoltmeters are essentially simple and make direct measurements of the voltage produced by noting its effect on a coil to which a pointer is attached. The millivoltmeter type is found commonly on the lance or the portable type used in nonferrous foundries. The millivoltmeter lends itself better to small portable equipment, and while it does sacrifice accuracy, the instrument can be made rugged and will perform satisfactorily in most cases.

The other type of measuring equipment for use with the thermocouple is a potentiometer. The potentiometer, instead of measuring the voltage produced in the circuit directly by deflection of a coil, as does the millivoltmeter, measures the voltage by comparing it to a standard voltage. The potentiometer can be calibrated to read directly in either millivolts or in degrees of temperature. Since the potentiometer is more complicated piece it usually requires a larger case and is less suitable for use on portable pyrometers. Consequently, most potentiometer setups are of the wall type where the pyrometer lance is separate from the measuring and indicating equipment. The potentiometer is regarded as more accurate than the millivoltmeter and less subject to breakdown.

The modern potentiometer used in the foundry is what is known as self- (*Please turn to page* 234)

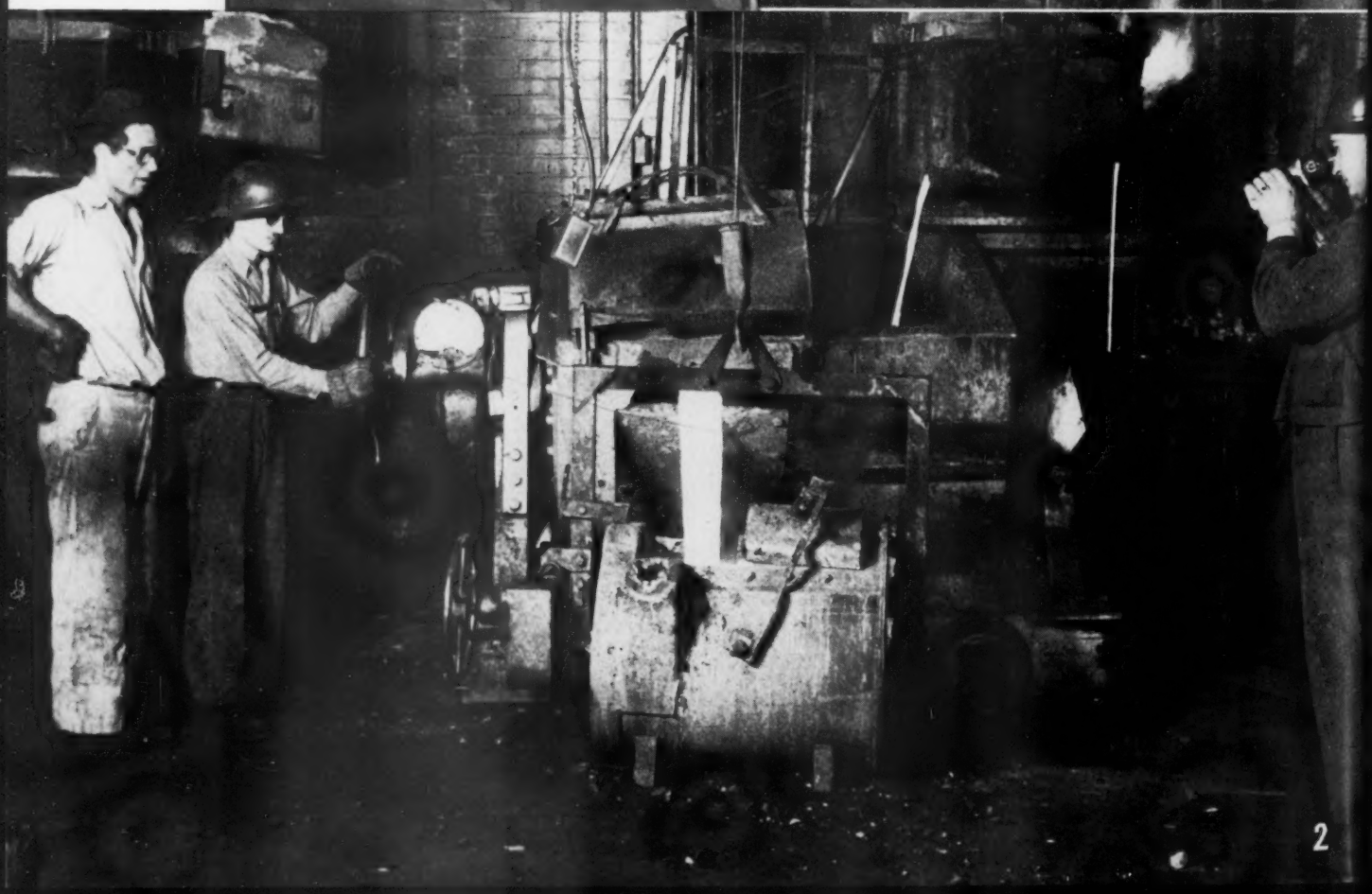
Efficient Operation

DOUBLES FOUNDRY

Fig. 1—Pouring mold on *D* molding line at mechanized foundry of Massey-Harris Co. Ltd., Brantford, Ont.

Fig. 2—Metal temperature is checked by optical pyrometer during ladle transfer

Fig. 3—Line of jolt squeeze molding machines producing molds for castings weighing from a few ounces to 25 lb



PRODUCTION.

By ROBERT H. HERRMANN
Associate Editor
FOUNDRY

CAREFUL planning and efficient operation have boosted production of gray iron farm implement castings over 100 per cent at "M" (mechanized) Foundry, Massey-Harris Co. Ltd., Brantford, Ont. Originally designed to produce 35 tons of finished castings in an 8-hour day, the foundry now is averaging 165 tons in two 9-hour shifts. Average daily melt is 240 tons and the yield 68 per cent. However, the total melt has been increasing, and during September a record 318 tons were melted in 18 hours.

Yearly output of the foundry is approximately 10 million castings averaging 6.4 lb in weight, from 1500 active matchplates and 300 active cope and drag plates. On a daily basis an average of 14,500 molds are made by 775 workers. From these molds are produced relatively small amounts of some 200 different castings. The plant furnishes cast parts for various types of farm equipment produced in the Massey-Harris assembly plants.

Melting Operations—Four 42-in. ID monolithic-lined cupolas comprise the melting department. Cupolas are run in pairs—two being operated for two 9-hour shifts while the other two are being repaired. At the end of the week, the two cupolas in operation Thursday night are run continuously for a 27-hour period until 2 a.m. Saturday. Largest volume of metal melted during this period was 427 tons.

Cupola charges are made up in cone-bottom buckets by one of two bridge cranes operating over the storage yard and charging platform. Empty buckets are placed on cars which run along a track on the ground floor under the charging platform. To gather a charge, the buckets first are placed under a funnel-like chute leading down from the charging platform. At this point the car carrying the empty charging bucket rests on a movable section of track forming the platform of a scale. The scale dial is mounted above the charging platform near the chute so that it can be seen clearly by the crane operator. Weights of the various charge materials are marked with red lines on the face of the scale to guide the crane operator as he drops the metallic charge materials into the chute.

The cranes are equipped with lifting magnets for picking up scrap and pig iron from the storage yard and carrying them to the chute or to the charging platform surrounding the chute. This platform serves as an emergency storage area from which charges can be made up by hand if a crane is not available and to reduce travel time of the crane when several buckets must be charged hurriedly.

Usually one crane is used for charge make-up while the other is unloading materials from railroad cars.

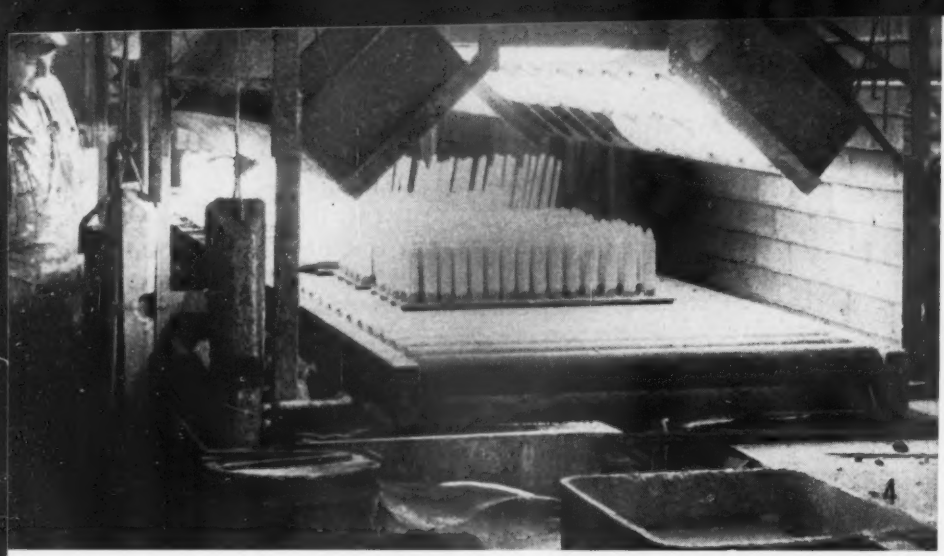


Fig. 4—Cores which are coated are dried under a battery of infra-red lamps mounted above a gravity roller conveyor

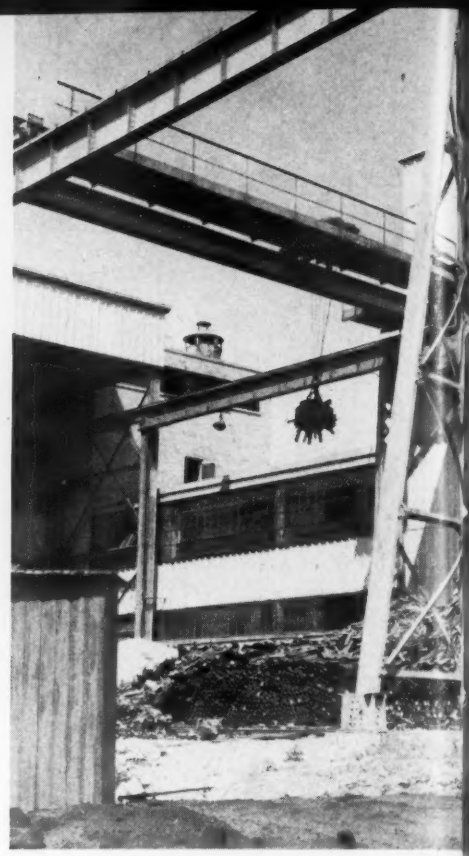


Fig. 5—One of two bridge cranes equipped with a magnet for gathering metallic constituents of the cupola charge

Efficient Operation

The latter is equipped with a magnet for unloading metallics and with a chamshell bucket for unloading coke and sand.

When a bucket has received the charge of metals, the car carrying it is rolled along the track and positioned on another scale under a hopper containing limestone. The door in the bottom of the hopper is opened and the correct weight of limestone allowed to fall into the bucket. Coke is charged in a similar manner from another hopper. Before being loaded into the hopper the coke is screened to obtain a uniform size. It is transferred from the screen to the hopper by bucket elevator.

When fully charged a bucket is pushed to the end of the track where it stops under a hole in the charging floor. A cupola charger operating on a monorail above the charging floor and in front of the charging doors of the four cupolas, lifts a loaded bucket through the hole by cable hoist and charges it into one of the cupolas. The empty bucket is returned through the hole to the car for picking up another load.

Cupolas are of the continuous pour, front slagging type. Slag falls into a bucket where it is broken up by a continuously running stream of water. Tapped iron is caught in large holding ladles to supply bull ladles traveling on an overhead monorail to the pouring stations.

Five different types of iron are poured daily. The base iron used for most castings has about 3.35 per cent carbon and 2.25 per cent silicon, tensile strength of about 30,000 psi and brinell hardness of 207-217. The iron designated as Fe2 is a modification of the basic iron with about 2.50 silicon. It is used on *A* and *B* molding lines for small castings requiring a softer iron. Fe3 is a second modification with about 2.80 per cent silicon and is used for castings with very thin section sizes. The increased silicon content in Fe2 and Fe3 is obtained by ferrosilicon additions at the cupola spout.

Two special irons have alloy additions. One is a hard iron with 0.5 per cent chromium, giving a tensile strength of 35,000 psi and a brinell of 217-235. The other contains 0.60 per cent molybdenum and 0.25 per cent chromium. It has 40,000 psi tensile strength and brinell hardness of 248. Alloy additions are made at the spout.

To maintain analyses of the various irons foundry laboratory technicians exercise close control over cupola charging. Exact weights of materials charged are determined on the basis of the metal required and the analyses of raw materials. Furthermore, analyses are made for carbon and silicon on samples taken from each cupola every hour. Analyses for manganese and sulphur are made two or three times daily, and for phosphorus once a day. Special irons are checked for alloy content in addition to the regular analyses. A chill test bar is poured from each cupola every 15 minutes.

Molding — Molding operations are performed on four molding lines. Molds for castings weighing from a few ounces to 25 lb are made on *A* and *B* lines; *C* line produces molds for castings weighing 25 to 150 lb, and *D* line handles work from 150 to 750 lb.

A and *B* lines utilize jolt-squeeze molding machines placed in two rows about 50 ft apart, with 14 machines in one line and 15 in the other. Each machine is served by an overhead sand hopper fed by belt conveyor from the sand mixers. Patterns are changed as often as two or three times a day on each of the

machines, indicating the variety of castings that are turned out on a mass production basis. Molding machine operators on each line place the molds on gravity roller conveyors which carry the molds toward a central steel apron conveyor located below floor level parallel to and midway between the two molding lines. Jackets are placed on the molds and the molds poured along the roller conveyor. With the exception of those made on the last molding machine in each line, the molds are dumped onto the apron conveyor for transportation to the shakeout. Casting with thin wall sections or others that might not stand the regular shakeout procedure are made on the two end machines and are hooked out by hand when the molds are dumped and placed in tote boxes for transfer by truck to the cleaning room.

The apron conveyor carries castings and sand to an enclosed and ventilated automatic shakeout. Sand at the shakeout is screened to remove lumps and foreign material and then passed over magnetic separators which eliminate remaining tramp iron. The cleaned sand is carried by belt conveyor to storage hoppers. Castings are discharged to a rubber belt cooling conveyor and carried outside the building past the *C* and *D* molding areas where they are dumped on another rubber belt which carries them back into the building for sorting. At this station workers pick castings off the belt and toss them into tote boxes according to size rather than type. At the end of the sorting belt a magnetic pulley removes tramp metal, automatically dumping it into tote boxes. Sand, which has accompanied the castings past the shakeout, falls down a chute to a belt under the floor and is returned to sand storage.

Medium molding line *C* is equipped with seven jolt-rollover and seven pin-lift machines, and *D* line has four jolt-rollover and four pin-lift machines which work in pairs. In addition, *D* line is equipped with two sandslingers. Air hoists transfer mold sections to roller conveyors where the mold is assembled and poured. Bottom boards used on these lines have pivot pins mounted on opposite sides. Jib cranes, with special pick-up attachments for lifting the mold-carrying boards by these pivot pins, swing the molds over one of three hooded shakeouts serving *C* and *D* lines. Workmen balance the mold until it is over the shakeout, where it is tipped quickly to fall on the vibrating grate. Shakeout sand receives the same screening and magnetic separator treatment it does on *A* and *B* lines. Cleaned sand is carried by belt conveyor to the storage hoppers.

Depending upon size and type, castings are moved to the cleaning room on hooks suspended from a monorail or by cooling conveyor which carries the castings outside the building and returns at the cleaning room area. The more fragile castings are transported in tote boxes by lift truck. The variety of work on *C* and *D* lines is not as great as on *A* and *B*, and patterns are run for one or two shifts before being changed.

Most pattern work is done in the company pattern shop by a staff of 60 men. Casting of aluminum matchplate patterns and cope and drag plates, however, is done by outside firms. Storage is provided for about 100,000 inactive patterns which are kept to fill replacement part orders and for other purposes.

Metal bottom boards are used throughout the

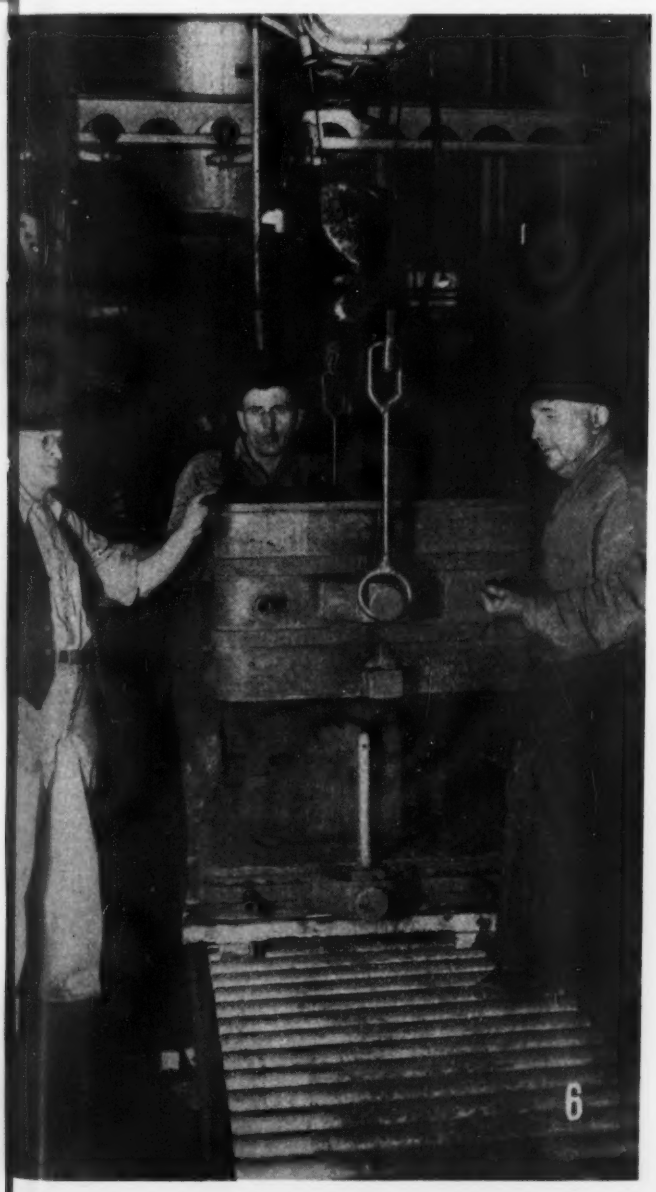


Fig. 6—Closing a mold on one of the molding lines

Fig. 7—Prepared sand is diverted from belt conveyor to hopper on a molding machine line

Fig. 8—Cores are loaded into the tower oven from coreroom belt conveyor at upper level and removed from the oven at ground level

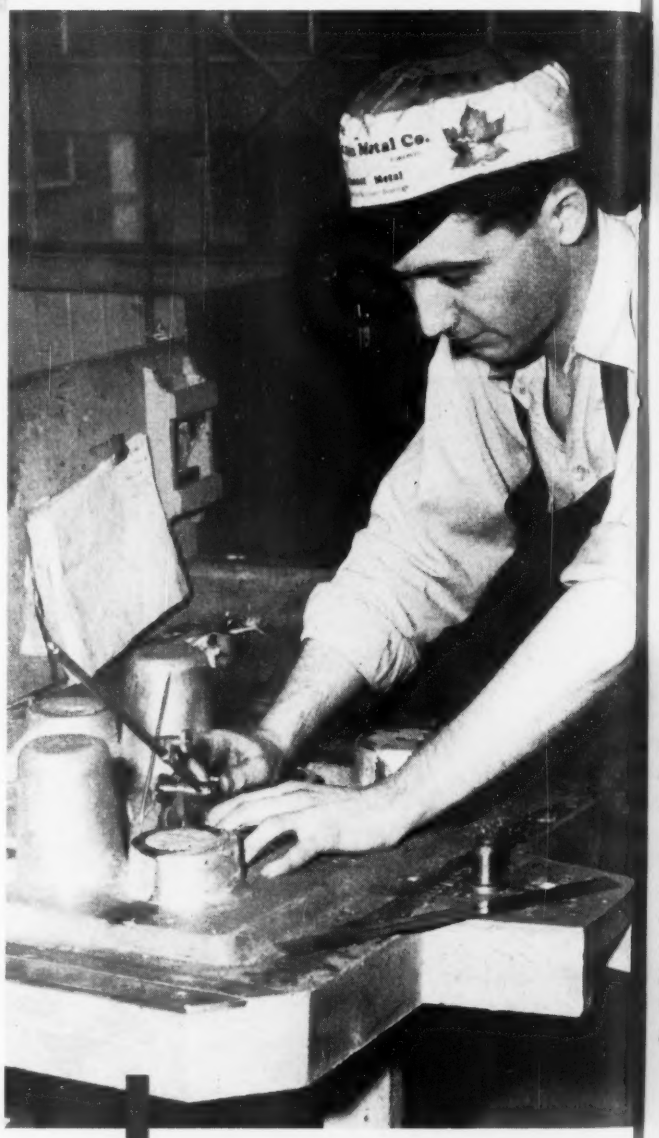
Efficient Operation

foundry. On *A* and *B* lines they are aluminum, and on *C* and *D* lines they are magnesium. Aluminum flasks and jackets are used on *A*, *B* and *C* lines, those on *A* and *B* lines being snap flasks. *D* line uses steel flasks. Maintenance men continuously check all flasks daily. Repairs are made or flasks replaced so that each shift operates with tip-top equipment. Near the flask repair room is a small floor area where repair parts are cast for machinery in the plant. In this area molding details are worked out for new jobs coming into the plant and sample castings are poured prior to placing the job in production.

Molding Sand—Molding sand requirements for the four molding lines total 2 million pounds daily. System sand is made up entirely of returns from cores and from the small amount of new sand used as facing for extremely heavy or very light castings to avoid buckles and scabs and to obtain a fine finish or fine detail. Sand in the system is made up of 60 per cent lake sand of 55 AFS fineness and 40 per cent bank sand of 100 AFS fineness. Spent sand from the shakeouts, from grating in the floors around molding stations, and from other points such as sorting of castings from *A* and *B* lines, is returned by belt conveyors under the foundry floor to the sand conditioning department. There it is elevated to three storage tanks above the two 2500-lb-capacity batch-type mixers.

Gravity movement of molding sand through various stages of preparation from storage hoppers to sand distribution belt is controlled by gates actuated by air-operated valves. The muller operator controls action of the valves through a series of levers. He also makes additions of bentonite, seacoal, wood flour and cereal binder with a hand scoop. Water is metered in according to formula, and the moisture content is held around 3.5 per cent. When thoroughly mixed, the sand is removed from the mullers to the prepared sand conveyor belt system which carries it to the molding stations. A separate and smaller muller is used to mix the comparatively little facing sand required by the foundry.

Core and facing sand additions to the system more than make up for sand loss, and 35 to 40 tons of system sand must be discarded daily. The company has been experimenting with reclaiming this sand for making cores and has had such a degree of success



Fg. 9—Patterns are checked closely for conformity to tolerances

Fig. 10 — Removing castings from swing table blast cleaning machine

that installation of permanent equipment for this purpose is being considered.

Formulation and properties of the system sand are controlled closely. Samples are taken every hour and checked in the laboratory for moisture, permeability, green and dry compression strength, density, and flowability. Results of each sand test are posted in a chart to form a continuous record which will indicate any deviation from acceptable standards and permit corrective measures to be taken before the condition becomes serious.

Core Sand—Three different core sand mixtures are used. Two contain varying amounts of high silica lake sand and bank sand, core oil and cereal binder. A high oil mix for special cores is dyed red for easy identification. The third type, from which about 25 per cent of the cores are made, is a resin mix and the cores are dried dielectrically. The company plans expansion of this operation to the point where 50 per cent of the cores are made in this manner.

All core sand mixes are prepared with two factors in mind: Production of good cores, and the building up of a satisfactory system sand for the foundry. Approximately 150,000 cores are made and used daily, production being one day ahead of scheduled use. They are made in accordance with a strict schedule designed to coordinate core production with the amounts of each type of casting to be poured in a given day. Core checkers are responsible for seeing that the correct number of good cores of a particular type are made and that they move in a steady stream to molders.

At present, most of the cores for *A*, *B* and *C* molding lines are made in the main coreroom on a mezzanine floor. Sand for these is mixed in a 560-lb-capacity muller on the main level and raised by skip bucket hoist to a hopper in the coreroom. An average of 70 tons of core sand is mixed and used daily. A special drying compound which accelerates oxidation of core oil is added to the mix during mulling. It is said to shorten baking time by 20 per cent.

At the coreroom level, the sand is delivered from the hopper by hand truck to coremakers' benches and core blowing machines. Coremakers' benches and eight core blowers are located in two rows, paralleling a slider belt leading to an oil-fired tower oven. Shelves suspended from the ceiling are located along the entire length of the slider belt for temporary storage of green cores in the event of a breakdown of the tower oven or momentary overloading of that oven.

An efficient maintenance crew never has permitted downtime caused by failure of the tower oven or slider belt to exceed 15 minutes. Coremaking facilities described above occupy about two-thirds of the rectangular-shaped coreroom. In the remainder of the room are two oil-fired batch-type ovens grouped around core benches for making small cores which will fit into the oven trays for baking. Baked cores from this section are loaded on hand trucks and taken down on an elevator to the ground floor for inspection, sorting and cleaning, and for pasting and coating where required. Cores in the tower oven are unloaded on ground floor level and the driers taken by hand truck on the elevator to the coreroom. Cores which are coated are dried under infra-red lamps on a gravity roller conveyor.

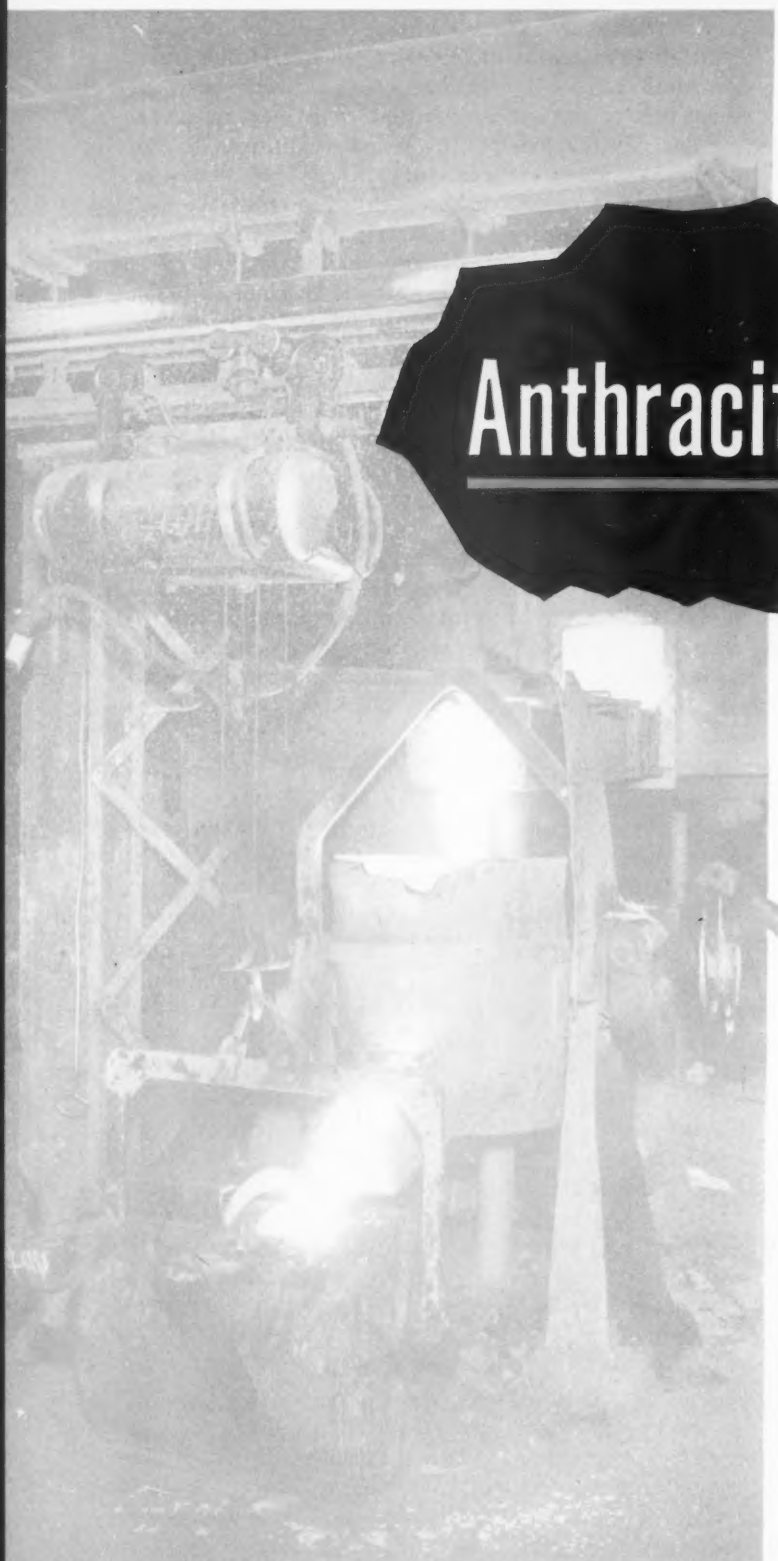
Heavy cores are made on rock-over machines in a small area next to *D* molding line. They are placed on racks and baked in four rack-type ovens located in that area. Another coremaking area is located near *A* and *B* molding lines. Here the cores are dried dielectrically. Two core blowing machines, in addition to benches, are utilized in the production of cores in this area.

Workers assigned to each molding line are responsible for keeping each molder supplied with appropriate cores for the job in progress. Finished cores are transported by hand truck and stored on racks in the molding areas for short periods to build up a supply from which molders' needs are filled.

Cleaning and Sorting — Castings from *A* and *B* molding lines which have been sorted into tote boxes as described previously, are brought to the cleaning room by truck. Castings from *C* and *D* lines arrive by overhead monorail carrier, conveyor, or tote box loads, depending upon size and type. Shot and grit blast cleaning operations are performed on a 56-in. swing table machine and two tumbling type cleaners. Additional equipment includes four tumbling barrels and pneumatic chipping hammers, pedestal grinders, and portable grinding tools. Current plans call for addition of an 84-in. swing table blast cleaning machine to help handle the increased volume of castings being produced.

Inspection of castings is performed in the cleaning room. Many of the castings, especially those to be used unmachined, are checked with gages for conformity to tolerances. Other castings, on which statistical quality control methods are being applied, are radiographed by an isotope of cobalt for determination of possible defects.

A special, final sorting line handles the 50-odd types of castings produced on *A* and *B* lines after they have been cleaned. Tote box loads of these castings are dumped on a moving belt. Sorters, standing along one side of the belt, pick off the castings and toss them into bins located on the opposite side of the belt. When the bins are filled, the castings are released through a trap door in the bottom into tote boxes and transported to the shipping room. All castings are shipped by truck and usually those castings made on one shift are (*Please turn to page* 240)



SELECTION AND USE OF Anthracite for Cupola Fuel

Interest in use of anthracite as a cupola fuel has increased with tightening in supplies of coke. The author offers recommendations to foundries contemplating the substitution of anthracite for varying quantities of their usual cupola fuel

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ANTHRACITE can be used to supplement or replace foundry coke in most cupola operation if reasonable care is used in its selection and handling, and if minor modifications are made in operating procedure. Up to 100 per cent anthracite has been used with excellent results for short heats at normal melting rates, and blends of 30 to 70 per cent anthracite with foundry coke have been used successfully in cupolas up to 66 in. in diam for high-speed, long-heat operations. In the following sections some of the factors of greatest interest and importance to foundries contemplating the use of anthracite are discussed in detail.

Size—Except for very small cupolas, broken or grate size anthracite should be used. Broken size is 4⅜ x 3¼-in. (round hole screens); grate is not a standard size but usually falls in the size range of 6 x 3 in. The equivalent square hole screen sizes can be obtained by multiplying by 0.81. A fuel size equivalent to between 1/10 and 1/12 the diameter of the cupola is the most desirable.

Size Stability—Size stability of anthracite to both mechanical and thermal shock is less than that of

good quality foundry coke. In general, the mechanical stability will be entirely satisfactory provided reasonable care is used in handling the fuel. Thermal stability, on the other hand, is an inherent property of the coal and varies from mining district to mining district and even to some extent within districts. Frequently, the lower volatile conchoidal fracture coals are more thermally stable than the higher volatile coals but no general correlation exists, so specific recommendations cannot be given.

Sulphur — The sulphur content of foundry sizes of anthracite will normally range from about 0.6 to 0.9 per cent. Little difficulty should be experienced in securing coals with sulphur contents of 0.8 or less. Controlled tests at two foundries showed no significant difference in sulphur pickup by the metal when using either coke or anthracite of the same sulphur content.

Ash—Ash content should be as low as possible and preferably below 10 per cent. Higher ash contents can be used but require more fluxing with limestone.

Ash Fusion Temperature—The fusion temperature of anthracite ash will usually range from 2800 to 3000° F. This necessitates the use of more limestone. The increase in stone requirements depends on the slagging properties of the coke ash as well as that of the anthracite, but initially it is good practice to increase the stone by a percentage equal to that of the anthracite in the coke-anthracite charges, i.e., for 20 per cent anthracite in the charge, increase the percentage of stone by 20 per cent. Fluidity of the slag will indicate whether this is too much or too little for the particular mixture and melting conditions.

Volatile Matter Content—Volatile matter content has little significance in cupola operations other than its effect on the carbon content of the fuel. Little if any contribution to the useful heat in the cupola results from the volatile matter, so, other factors being equal, those anthracites with the highest fixed carbon content, as charged to the cupola, are preferred.

Moisture Content—Because of its smooth surfaces, foundry size anthracite will normally carry much lower moisture content than coke after exposure to wet weather. There is also less tendency for fines to cling to the wet surfaces and be carried into the cupola. The advantages gained due to these factors depend largely on the weather and on storage and handling facilities, but may be significant in some instances.

Handling—Because anthracite will not stand the rough handling to which coke is frequently subjected around a foundry, without serious size degradation, it cannot be emphasized too strongly that handling procedures be examined and where necessary modified to minimize unnecessary breakage. Although more important with anthracite than with coke, most foundries would find a critical examination of their fuel handling procedures to show that unnecessary breakage is resulting from antiquated or improper handling equipment and procedures. Even with high quality coke the production of 10 per cent or more of minus 1-in. material due to rough handling is not uncommon.

Where this fine material is removed prior to charging and can be used to fire other equipment, the loss may only amount to a dollar or so per ton of coke purchased. Where it is charged to the cupola however, hidden losses will frequently exceed this amount greatly. Excessive fines increase wind box pressure, increase fly carbon nuisance, increase fuel requirements, decrease capacity, decrease flexibility and, frequently as a secondary effect, decrease metal quality and result in higher reject losses. Where anthracite is used in the charges, the influence of coke or anthracite fines will be accentuated because of the normally higher wind box pressures inherent in the use of anthracite.

Windbox Pressures — Because of its shape and higher density, anthracites have a bulk density of 50-55 lb per cu ft compared with 28-32 for coke. This denser packing produces an increase in resistance to gas flow so that higher windbox pressures will result. In foundries where a positive displacement blower is used this will have little effect on the operation but where centrifugal blowers are used, increase in wind box pressure frequently will be the limiting factor in how much anthracite can be used. If, in order to supply the necessary wind, the blower already is operating near the pressure limit, anthracite may increase pressure enough to reduce the wind available. This will affect the fuel-air ratio adversely and invariably result in unsatisfactory operation. At least 3 to 5 oz leeway in pressure always should be available to meet any emergency condition that may arise where additional wind is needed for one reason or another.

Charging—If good charging practices are used, no modifications are required other than substituting anthracite, pound for pound, for coke in the charges, All fuel and metal charged to the cupola should, of course, be weighed accurately for best operation, but if blends of anthracite and coke are used accurate weighing assumes greater importance. Anthracite and coke are not directly interchargeable on a volume basis because of the large difference in bulk densities, and unless careful weight ratios are maintained, both the proportion of anthracite in the charge and the fuel ratio may be in considerable error.

In loading and dumping the charging buggy, breakage of fuel frequently results from permitting heavy metal to drop from considerable heights onto the fuel. This is undesirable with coke and even more so with anthracite. Minimizing the height the metal and fuel charges are dropped will usually pay dividends, and where it (*Please turn to page* 210)

TABLE I—Typical Anthracite Operations

Cupola Diam., in.	Anthracite (% used)	Fuel Ratio	Tuyere Type	Tapping
66	35	6/1	Standard	Intermittent
54	50	6.6/1	Balanced Blast	Continuous
48	35	6/1	Balanced Blast	Continuous
45	20–80*	4/1 to 10/1*	Balanced Blast	Continuous
42	50	9/1	Balanced Blast	Continuous
42	100	7/1	Standard	Intermittent
36	100	10/1	High Velocity	Intermittent
30	60	9½/1	Balanced Blast	Continuous
30	40	10½/1	Balanced Blast	Continuous
24	50	6½/1	Balanced Blast	Continuous

* Over a year's operation. Percentage anthracite varied with quality of coke; fuel ratio with percentage of steel scrap and casting requirements.

STEELMAKING FOR A

Continuing his discussion of steel foundry practices, the author now turns to melting, pointing out the advantages and disadvantages of the different units commonly used. Previous articles published in 1948 and 1949 issues of FOUNDRY covered patterns and molding methods; machine molding, flasks and rigging, and core and molding materials appeared in 1949 and 1950

STEELMAKING practice in foundries differs in several respects from that followed in producing ingots for forging or rolling. As a rule, ingots are filled from the top and are of such simple shape and usually so large that as long as the steel is hot enough to run through a nozzle it will readily fill the molds. Therefore, an entire ladle of steel can be poured into ingots without becoming too cool to handle.

Even when very small ingots are bottom poured in batches through a common down-sprue and individual runners, trouble with misruns will seldom be experienced, no matter how "cold" a heat of steel may be. In most steel castings, on the other hand, especially small castings, there are portions so thin that they can be "run" only with very hot and fluid steel. Therefore, the temperature of the metal must be a good deal higher in foundries than in shops producing ingots.

In foundries, too, the last metal poured from the ladle must be hot enough to run comparatively small castings. In the rolling mills, a short ingot can often be used, and even when a "butt" is produced from the last steel in the ladle, the money loss is of little consequence, since it costs next to nothing to set up ingot molds for pouring. In the foundry the case is quite different, because when a casting is "poured short," the labor and material cost of making the mold is a complete loss. As a consequence, when the ladle is nearly empty, the smaller castings are selected for pouring, in order to "slag" on as inexpensive a mold as possible. To "run" these smaller pieces the temperature of the steel must still be comparatively high. Hence, the total weight of the heat must be such that the steel can all be poured before it becomes too cold. The size of the melting unit, then, must bear a direct relation to that of the castings to be made.

Temperature—With the electric furnace it is easy to produce steel of any desired temperature; indeed the melter makes the steel too hot more often than too cold. Formerly steel melted in crucibles, which can be made quite hot and fluid, was used to pour light work, but the cost of crucible melting is now so high that in the United States this method has disappeared from all but one or two plants of very limited size and capacity. Very hot steel can be made in a side-blown converter, and for many years this process has been used with success in foundries specializing in the production of small steel castings.

From time to time during the past 50 years, efforts have been made to develop small open-hearth furnaces that would produce steel hot enough to run light castings. To keep the steel hot, one designer even tried to operate a furnace with a portable body that could be used instead of a ladle. The furnace had a nozzle in the back wall instead of the usual

tap-hole, and when the steel was ready to pour a stopper rod was put in position through the charging door, and the furnace body lifted with the crane and carried to the pouring floor. This design was not successful, and in no case have the operators of small open-hearth furnaces been able to consistently make steel hot enough to pour small castings with thin sections. The open-hearth process is, therefore, used only in foundries making medium and heavy pieces. For light work, either the electric furnace or the converter is preferred, the choice between the two processes depending on factors other than the temperature of the steel produced.

Fluidity—The fluidity of steel, or its ability to flow freely in light sections, is measured by pouring the metal into spiral passages of small cross section, in sand molds so designed that the momentum of the stream flowing from the ladle is eliminated, and the steel enters the spiral at constant pressure. The distance the metal flows in this narrow passage is a measure of its fluidity, and as a rule varies directly with its temperature. However, there appear to be other factors besides temperature that affect the fluidity of steel. One of these is the degree of deoxidation to which the metal is subjected in the steelmaking process.

When the electric furnace was first introduced in steel foundries, a basic lining and a basic slag were used, and the practice followed was exactly the same as had proved successful in making steel for ingots. Successive additions of coke dust were made to the slag until the greater part of the metallic oxides it contained were reduced and it became almost white when cooled off. Sometimes even more coke dust was used, so that the slag became dark colored from the calcium carbide produced under the arc, and would give off acetylene fumes when moistened. Both white and carbide slags would crumble to powder as they

R ASTINGS

cooled since they consisted chiefly of lime and silica. The steel made in this way was deoxidized quite thoroughly.

Naturally, it was thought that to obtain steel of the highest quality, it was necessary to imitate ingot practice and operate with these completely reduced slags. It soon appeared, however, that even when made very hot, steel so produced lacked fluidity and was unsatisfactory for the production of large numbers of small castings that were poured with "shank" ladles. When about half of the steel had been poured from a shank, the rest simply would not "run" the castings.

A few years later, the industry began to hear of "over-reduced" steel, and certain operators had learned that by cutting the reduction process short and tapping the steel while the slag was still brown from unreduced oxides, they were able to "run" light castings much better than when a white slag was produced. Since the quality of the steel so made, as judged by the usual tests, was quite satisfactory, this method of operating the basic electric furnace probably would have been adopted widely in steel foundries, had the industry not largely abandoned the basic process.

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Consultant
Swarthmore, Pa.

About 1918, the first acid-lined electric furnaces were installed, and in a comparatively few years the acid electric process had displaced the basic in almost all American steel foundries. One of the chief reasons for the change was that acid electric furnace steel readily could be made so fluid that it would successfully run the lightest sections, and whole heats could be "shanked" with almost no trouble from misruns. Indeed, it is hard to make acid electric furnace steel that does not possess good fluidity, unless it is deliberately tapped from the furnace too cold to run the castings. Therefore, it was only natural that the acid process soon became standard in steel foundries using small electric furnaces to make light castings.

Another reason for adoption of the acid process was that most of the furnaces installed in steel foundries were rather small so that it was easy to obtain enough low-phosphorus steel scrap to operate them at full capacity. Therefore, there was no reason to use the basic method and melt higher phosphorus raw material, which necessitated "two-slag" operation. The one-slag acid process was much faster and consequently cheaper. It would have been possible, of course, to melt low-phosphorus steel scrap in the basic furnace and follow one-slag practice, but even so the acid method was more economical because it used less expensive refractories.

Nature of Slag—A third factor that influenced the choice between acid and basic melting was the nature of the slags in the two processes. Acid electric furnace slag contains so much silica, and therefore has so high a melting point, that it soon forms a pasty coherent mass in the ladle, and is readily prevented from getting into the shank ladles used to pour off small castings. Basic slag, on the other hand, is more fluid, and only by exercising constant vigilance can it be kept out of small molds. True, the teapot ladle was developed to take care of the problem of holding back the slag when filling shank ladles or pouring medium-size molds direct. It was introduced, however, about at the same time that the acid process was adopted, and though it keeps back gummy slags, it does not entirely prevent fluid ones from getting into molds and shanks, after the main ladle is about two-thirds empty.

With bottom-poured ladles, of course, no slag can get out with the steel, but really light castings are not often poured direct from the ladle, and shanks are almost never filled through a nozzle and stopper. Skimming lips in shank (*Please turn to page* 228)

Homogenization

The authors' investigations indicate that for heavy-section steel castings, particularly higher carbon content material, the increased hardenability and better yield-tensile ratios obtained by homogenization heat treatment —a high-temperature anneal—may well warrant employment of this process

AS STEEL solidifies, the first solid to appear is rich in iron and poor in carbon and other alloying elements. The precipitating crystals of relatively pure iron follow a dendritic pattern in freezing. As freezing progresses the metal depositing on the original skeletons of the dendrites becomes increasingly richer in carbon and alloying elements until the last metal to freeze in the interstices of the dendrites contains the richest concentration of the alloying elements.

If equilibrium were maintained at all times during cooling, this segregation would disappear by diffusion. However, if sufficient time is not available for equilibrium to be attained, as in the case of most steel castings, the concentration gradient between the skeleton of the dendrite and the last metal to freeze will persist.

The retention of segregated areas high in carbon and alloying elements gives these areas a higher hardenability than the surrounding areas which solidified first. The result is that the steel presents a nonuniform microstructure at room temperature. Thus, on air cooling some areas might be ferrite and pearlite whereas others might be martensitic or some intermediate transformation product. Fig. 2 shows, for example, a cast alloy steel which exhibited interdendritic areas of martensite in a matrix of fine pearlite and ferrite after air cooling from 1600° F. This figure illustrates the fact that the cores of a dendrite having a low concentration of alloying elements are less stable in the austenitic state than are the interstices of the dendrites. Consequently, their critical cooling rate is higher than that of the interdendritic areas.

If the cooling rate of the casting does not pass the critical cooling rate of the cores, but passes that of the alloy-rich areas, the dendrite cores will tend to decompose to high temperature constituents during cooling while the alloy-rich areas will transform entirely to martensite. The resulting structure is a mixture of soft and hard phases. If the harder phase is distributed as a network pattern, plastic deformation of the softer phase will be restricted and ductility will be impaired. This lack of homogeneity is also assumed to have a deleterious effect on other properties as well. This based on the knowledge that a homo-

This paper is based on a thesis submitted by Mr. Aktutay, Ankara, Turkey, in partial fulfillment of the requirements for an M.S. degree in Metallurgical Engineering at the University of Wisconsin.

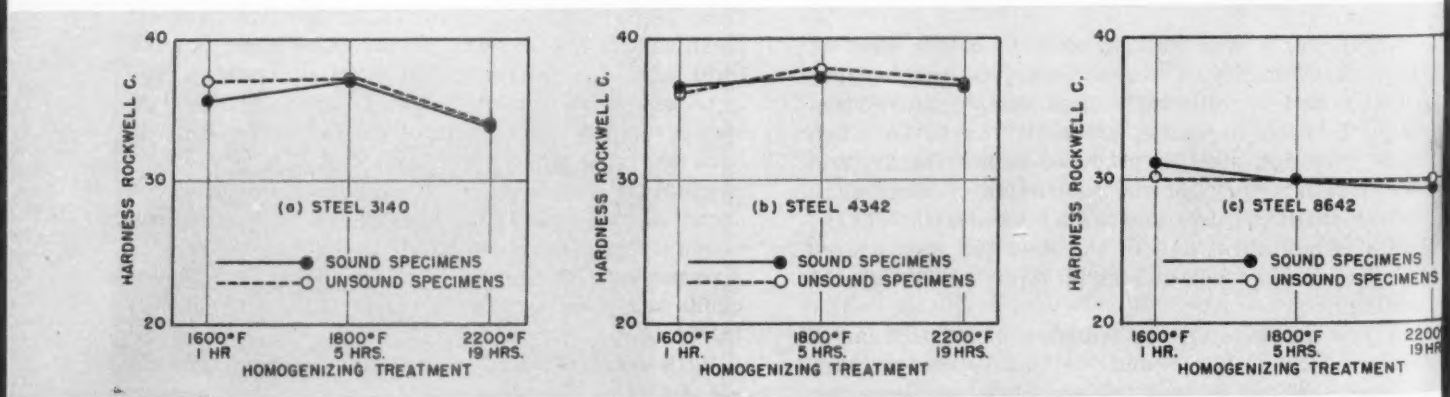

Fig. 1—Hardness of the tensile bars after homogenizing for periods indicated, quenching and tempering

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University of Wisconsin
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...of Cast Steels

geneous microstructure, exemplified by tempered martensite, gives the best combination of mechanical properties for a given hardness.

The properties which, in addition to hardenability and ductility, would most likely be affected to the greatest extent by nonuniform microstructure would be impact strength and the yield strength.[1] Hollomon and Jaffee,[2] for example, show the importance of having tempered martensite to insure good notch-bar impact properties and a high yield-tensile ratio. Fig. 3 illustrates the differences in these properties that can be obtained by having structures other than tempered martensite. There is good evidence, therefore, that if inhomogeneities occur in steel castings, these castings do not approach their ultimate in mechanical properties.

The foregoing information indicates that segregation of carbon and alloying elements, on the whole, is detrimental. Avoidance of segregation is generally impossible, but recourse can be made to the use of a high-temperature annealing treatment, often referred to as an homogenization heat treatment, which theoretically can eliminate or reduce segregation existing in cast steel. Such homogenization heat treatments are well known to cast steel foundrymen and have at one time been more or less standard practice, but information published on this subject[1] has raised a question regarding the usefulness of this practice. Instances[3, 4] have been cited where no change in hardenability was observed after homogenizing and no appreciable change in mechanical properties resulted. On the other hand, ballistic properties have been improved by homogenization[1]. In one case[3] where the effects of homogenization were studied it was concluded that any beneficial effects that may have resulted from the homogenization heat treatment were overshadowed by steel "quality" such as porosity, inclusion distribution, etc. This latter form of segregation is also important, but since it cannot be corrected by heat treatment, it was not considered in the present instance.

The foregoing information has indicated a number of uncertainties regarding the homogenization heat treatment and its effectiveness when applied to steels of different composition and quality. Because of the indifferent results obtained by others from homogenization heat treatments and because of the apparent overshadowing effects of steel "quality" on these results in certain cases, it was felt that this problem should be studied further and that a better evaluation of the heat treatment might be had by using steel cast into keel block molds to produce castings essentially free of "quality" defects.

Three grades of steel of varying alloy content were selected for the experiment. They were purchased as 1-in. bar stock and remelted in a 17-lb. high-frequency induction furnace. Table I gives the analysis of the wrought steel bars before melting. This metal was cut to suitable lengths for melting. It was brought to 2900° F and killed with 0.1 per cent aluminum before pouring. No other additions were made. Each heat was poured into baked keel block molds which produced a casting with two keels, the overall dimensions of the castings being 2¾ in. square by 5 in. long.

Table II indicates that an average carbon drop of about 0.05 per cent resulted from the melting operation.

Tensile specimens and Charpy bars were taken from the keel legs and were used to represent sound metal. Similar specimens were also removed from the head of the keel block to represent metal of poorer quality and a slower rate of cooling. The tensile bars were rough-machined to 0.9-in. diameter and the Charpy bars to 0.5-in. square before heat treating.

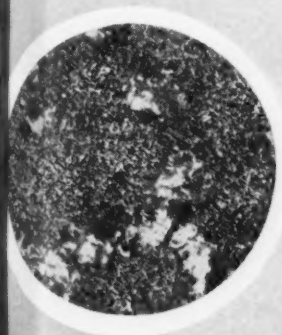


Fig. 2—Dendritic segregation in cast alloy steel air cooled after holding 1 hr at 1600°F. X100

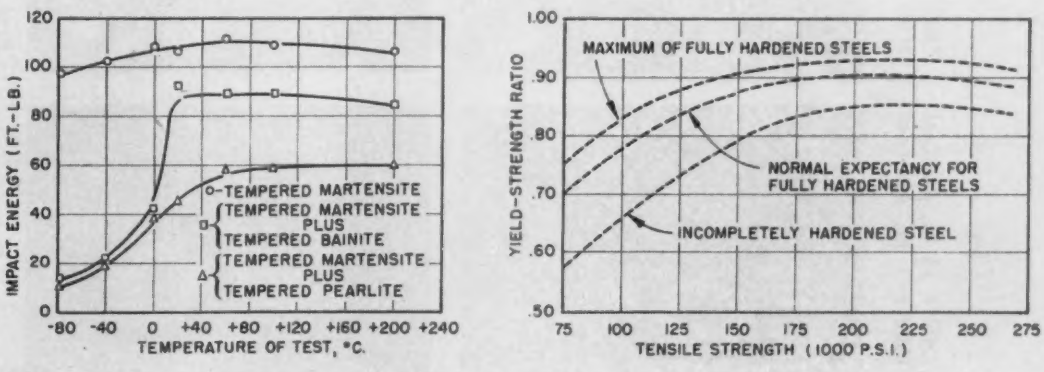


Fig. 3—Both notched-bar properties and yield-tensile ratios are improved when the microstructure is tempered martensite[2]

Homogenization

The homogenization treatments were chosen to represent a very mild heat treatment, an average commercial heat treatment and a severe homogenization heat treatment. The temperature and time combinations for these three were 1600°F for 1 hour, 1800°F for 5 hours, and 2200°F for 19 hours, respectively.

The specimens heated to 1600°F were oil-quenched directly. Those heated at 1800°F or 2200°F were reheated after the homogenization heat treatment, held one hour at 1600°F and quenched in oil. In the case of the specimens receiving the 2200°F treatment a preliminary grain refining heat treatment at 1600°F for ½-hour was also used.

The 3140 and 4342 steels were tempered to 35½ to 37½ Rockwell C by heating the former to 1000°F for 30 minutes and the latter to 1200°F for 30 minutes. Steel 8642 was tempered at 1000°F for 30 minutes and a hardness of 30-31 RC resulted. This steel was not tempered below 1000°F in order to avoid possible temper brittleness in the impact specimens.

Fig. 1 shows that the hardness after tempering of steels 3140 and 4342 increased slightly after homogenization at 1800°F, but dropped slightly after the 2200°F treatment. This drop apparently was caused by slight decarburization since a hardness survey across the diameter of a tensile bar gave a peak of hardness at the center. Steel 8642 had practically constant hardness for the three treatments.

Structural Changes From Homogenization—Specimens were macroetched to reveal the effects of the heat treatment on the as-cast dendritic structure. The greatest improvement occurred in steel 4342, where a more diffused dendritic pattern occurred after the homogenization treatment at 2200°F. This difference is illustrated in Fig. 5. No porosity was noted in specimens taken either from the heads or the legs of the keel blocks.

The effects of the three homogenization heat treatments on the microstructure obtained after air cooling from the homogenization temperature are compared in Fig. 4 on the basis of similar austenitizing temperatures. It is apparent that a considerable change occurred as a result of the heat treatments. The dendritic pattern was essentially eliminated only by the 2200°F treatment, and even this heat treatment was not entirely successful in this respect. Because of its higher alloy content, steel 4342 retained

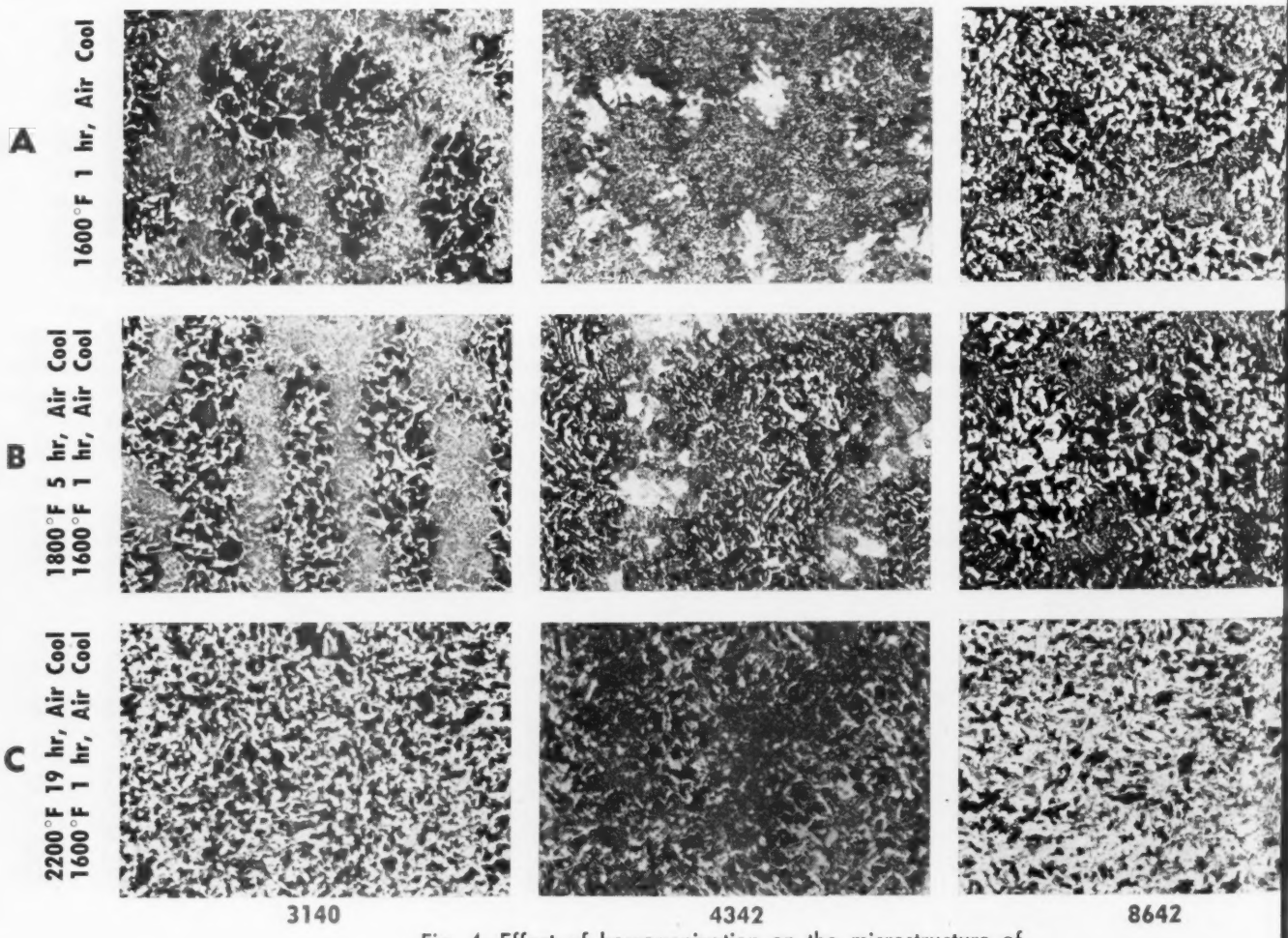


Fig. 4—Effect of homogenization on the microstructure of steels 3140, 4342 and 8642. X100, 2 per cent nital etch

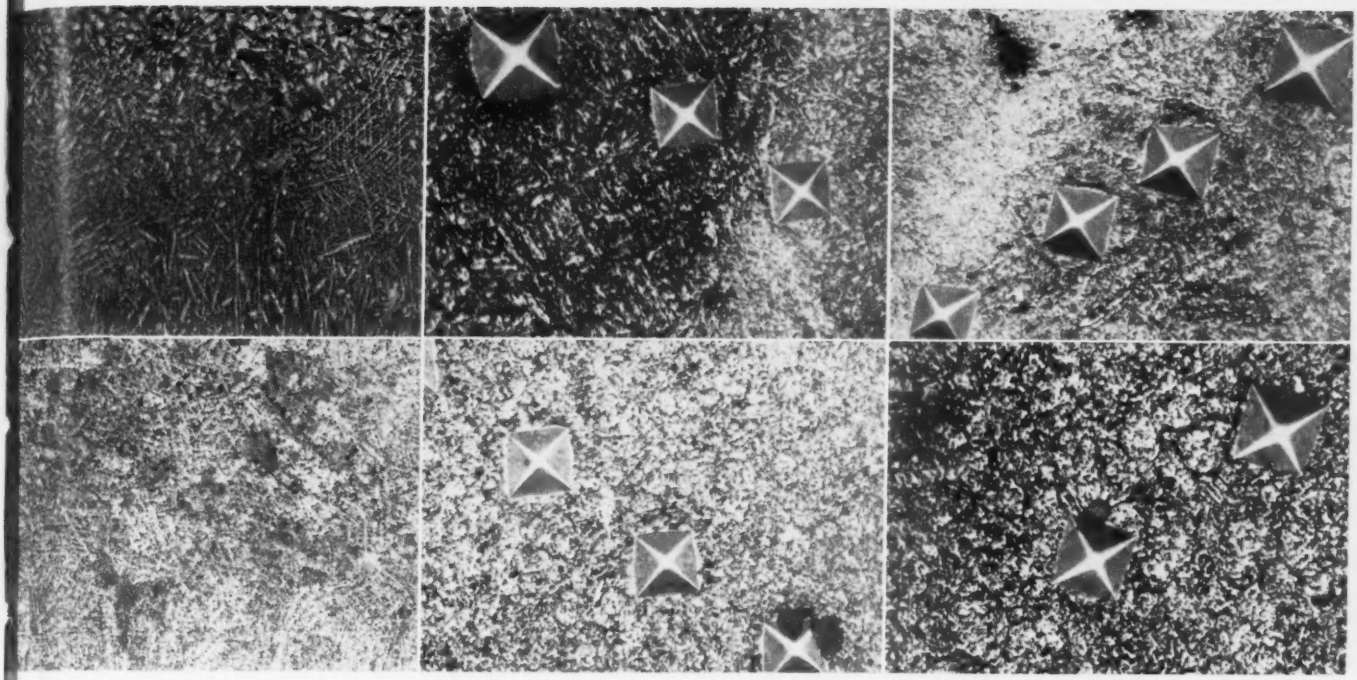


Fig. 5 — Macrostructure of steel 4342. *Top:* Homogenized 1 hr at 1600°F, air cooled. *Bottom:* Homogenized 19 hr at 2200°F, air cooled

Fig. 6—Change in microhardness of 4342 after homogenization at *(top)* 1 hr 1600°F, *(bottom)* 19 hr 2200°F, and reheating, quenching, tempering

Fig. 7—Change in microhardness of 8642 after homogenization at *(top)* 1 hr 1600°F, *(bottom)* 19 hr 2200°F, and reheating, quenching, tempering

martensite in the interdendritic areas after homogenizing at 1600°F or 1800°F, whereas the other two steels showed a variation in the ferrite-pearlite pattern.

Effects of the homogenization heat treatments on the microstructure were also checked with a microhardness survey. Table III and Figs. 6 and 7 show that the large differences in hardness between the dendritic areas and the interdendritic areas decreased greatly after holding 19 hours at 2200°F. However, complete elimination of segregation was not achieved.

Hardenability—The marked change in microstructure produced by the homogenization at 2200°F suggests the possibility of a change in hardenability as well. This was verified by end-quench hardenability tests. The hardenability of all three steels was increased by homogenization heat treatments, with the greatest increase occurring for the steel of highest alloy content and for the highest homogenization temperature. Figs. 8 to 10 illustrate these trends. In the light of the introductory statements regarding the relationship between homogenization and hardenability, this effect should be expected since the homogenization would add more alloy and carbon to those areas originally low in these elements and prevent thereby their rapid transformation.

However, indifferent effects on hardenability have been obtained by others from homogenization[3, 4] and in one case[9] the opposite effect prevailed. In that case, a wrought steel showing banding effects had a decreased hardenability after homogenizing. The fact that the steel was hot rolled rather than cast may have a bearing on the results since hardenability

TABLE I—Chemical Composition of the Steels Used as Melting Stock

	Steel No.		
Element	3140	4342	8642
Carbon, %	0.405	0.43	0.43
Manganese	0.80	0.72	0.84
Phosphorus	0.018	0.017	0.018
Sulphur	0.029	0.016	0.028
Silicon	0.26	0.28	0.23
Nickel	1.27	1.75	0.49
Chromium	0.66	0.80	0.46
Molybdenum	0.06	0.27	0.22

TABLE II—Carbon Content of Steels After Melting

	Per Cent Carbon		
Steel No.	Legs	Heads	Top of Casting
3140	0.35	0.36	0.38
4342	0.37	0.36	0.39
8642	0.36	0.37	0.395

TABLE III—Microhardnesses of Steel After Homogenization at 1600 and 2200° F

	Ave. Hardness of Dendritic Cores (Diamond Pyramid Hardness No.)	Ave. Hardness of Interstices of Cores (Diamond Pyramid Hardness No.)	Difference Between Cores and Interstices
Steel 3140			
1600° F	313	370	57
2200° F	325	355	30
Steel 4342			
1600° F	333	380	47
2200° F	350	371	21
Steel 8642			
1600° F	270	375	125
2200° F	272	312	42

Homogenization

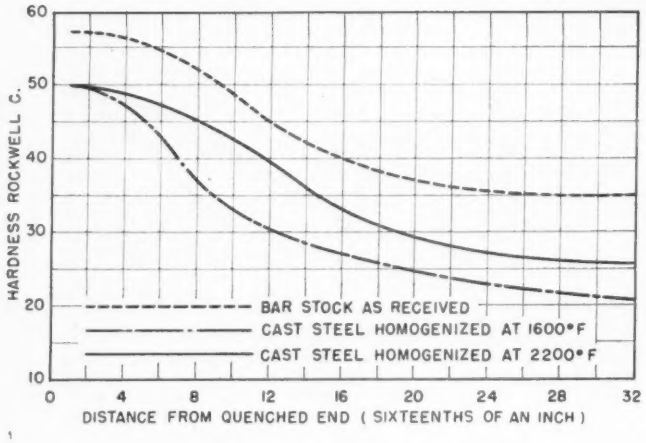


Fig. 8—Effect of homogenizing temperature and time on hardenability of steel AISI 3140

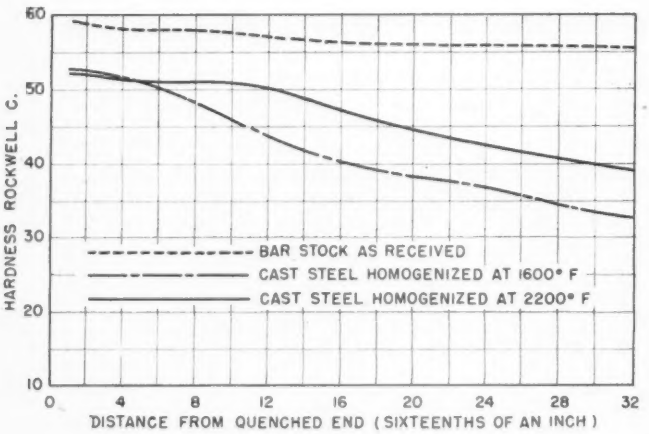


Fig. 9—Effect of homogenizing temperature and time on hardenability of steel AISI 4342

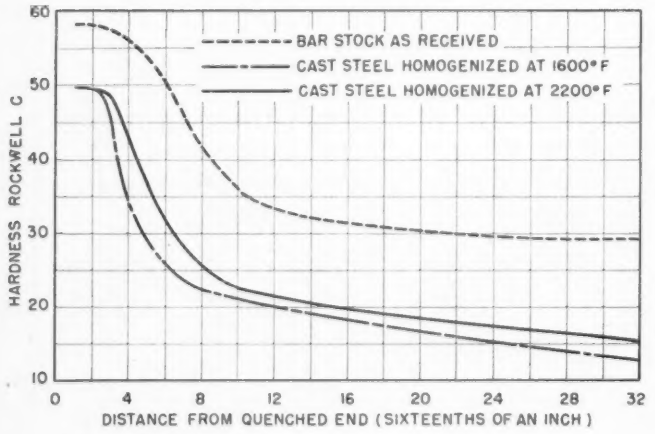


Fig. 10—Effect of homogenizing temperature and time on hardenability of steel AISI 8642

is measured by the hardness test and this could give varying results when applied to nonuniform microstructures depending on the degree of segregation existing. The segregation in banded wrought steel could not be expected to be so severe nor so coarse as in cast steel. It is conceivable, therefore, that the particular microstructural combinations existing before homogenizing could indicate a higher overall hardenability than afterward.

The steels tested in the present case were higher in carbon than those in the instances cited[3, 4] where no increased hardenability was apparent. It is possible, therefore, that the effects of homogenizing might be critically dependent on carbon content. Of the five steels tested in one of the earlier studies,[3] three were fairly low in carbon (0.27, 0.23 and 0.25), one had 0.40 per cent C but also a high alloy content; so the hardenability was essentially immeasurable by the end quench test since the curve deviated only slightly from the horizontal, and the fifth had 0.32 per cent carbon and a measurable hardenability. This latter steel, with the second highest carbon of the series, showed a slight tendency towards higher hardenability after a severe homogenization. Subject to confirmation by more tests, the data do suggest that the hardenability response to homogenization is related to the carbon content, steels having a carbon content in excess of 0.30 per cent being benefited more than those in the neighborhood of 0.30 per cent.

Notched-bar tests—The Charpy V-notch test results obtained at −40°F are plotted in Figs. 11 to 13. These results are the average of two test bars. Only a slight general improvement in the test values resulted from increasing the intensity of the homogenization heat treatment.

The location of the test bar in the original casting, whether from the head or leg of the keel block, is seen to have a proportionately greater effect on the results than the homogenization treatments. This effect can be attributed to possibly more porosity and to greater segregation in the slower-cooled heads of the keel blocks. That segregation may be the primary factor is supported by the fact that the two steels having the highest alloy content, 3140 and 4342, showed the greatest difference in results. This suggests that the effects of segregation and mass on notched-bar properties are intensified in steels of higher alloy content. This would be an important factor when casting highly alloyed steels in heavy sections.

No evidence of sensitivity to temper brittleness was uncovered for the three steels when subjected to the specific tempering treatments used in this experiment.

The alloy content in the steels was reflected in the general level of the impact results. Steel 8642 with the lowest alloy content had the lowest impact strength. This occurred despite its lower hardness after tempering. Apparently, quenching to a completely martensitic structure was not achieved.

Tensile Properties—The tensile properties obtained are summarized in Table IV. For steels 3140 and 8642 the tensile strength of the bars taken from the heads of the keel blocks was somewhat higher than

that of bars from the keel legs. This might in part be attributed to a slightly higher carbon content in the head but more probably points to very little difference basically in the properties in these two locations.

The most noticeable effect of homogenization is the increased yield strength with increasing homogenization. This can be attributed to the better distribution of alloying elements and the resultant increased hardenability obtained by homogenization. As mentioned in the introduction, a fully quenched and tempered structure gives a better yield-tensile ratio than obtained from incompletely hardened structures of similar tensile strength.[2] This was illustrated in Fig. 3. The effect of the homogenization heat treatments on the yield-tensile ratios obtained in the present case are illustrated by Fig. 14. With only one exception, the ratio increases markedly as the degree of homogenization increased. The one exception can be attributed to a poor yield strength reading.

Discussion — To be effective, an homogenization heat treatment would not only have to cause diffusion of carbon, but of alloy content as well. It is generally supposed that the alloy content is that factor which is most re- (*Please turn to page* 242)

TABLE IV—Tensile Test Results of Quenched and Tempered Steels

Specimens Homogenized	Ult. Stgth.	Yield Stgth.	% Elong.	% Red. of Area	Yield Ratio
Steel 3140					
Sound:					
1 hr 1600° F	146800	113000	8.5	22.3	0.77
5 hr 1800° F	155400	125000	9.0	22.0	0.806
19 hr 2200° F	154000	143500	8.5	25.0	0.935
Unsound:					
1 hr 1600° F	162900	124400	6.0	15.7	0.765
5 hr 1800° F	158200	125700	7.0	16.2	0.795
19 hr 2200° F	157800	150000	6.5	15.0	0.95
Steel 4342					
Sound:					
1 hr 1600° F	165500	147000	9.0	22.3	0.889
5 hr 1800° F	165300	155500	10.0	23.1	0.94
19 hr 2200° F	168100	139000	8.0	25.1	0.826
Unsound:					
1 hr 1600° F	155050	132000	7.5	19.5	0.854
5 hr 1800° F	158150	149000	9.2	22.9	0.941
19 hr 2200° F	159000	154000	9.0	21.0	0.970
Steel 8642					
Sound:					
1 hr 1600° F	133950	102000	11.7	34.5	0.763
5 hr 1800° F	132950	108750	12.5	31.1	0.819
19 hr 2200° F	136300	128000	10.0	34.5	0.940
Unsound:					
1 hr 1600° F	135000	100500	6.0	19.8	0.745
5 hr 1800° F	143000	111300	9.0	20.8	0.790
19 hr 2200° F	141000	131300	8.5	19.7	0.930

TABLE V—Rates of Diffusion of Elements in Austenite at 2190°

Element	Steel	Rate of Diffusion, sq cm per sec
Manganese	0.6% C; 4.0% Mn	21×10^{-11}
Nickel	0.6% C; 4.0% Ni	9×10^{-11}
Molybdenum	0.4% C with Mo	1.48×10^{-10}
Carbon	0.6% C	1.9×10^{-6}

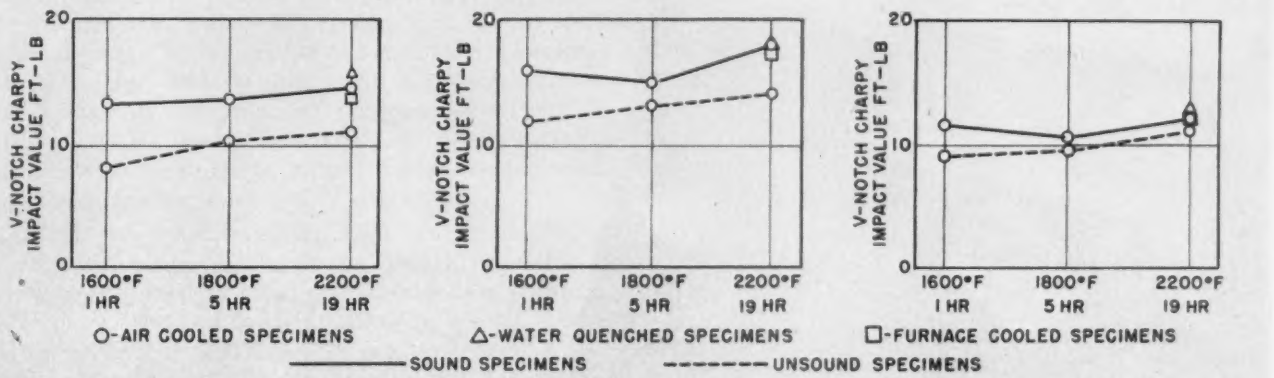


Fig. 11—Steel AISI 3140 Fig. 12—Steel AISI 4342 Fig. 13—Steel AISI 8642

Effect of homogenizing on V-notch Charpy values of three steels at —40°F

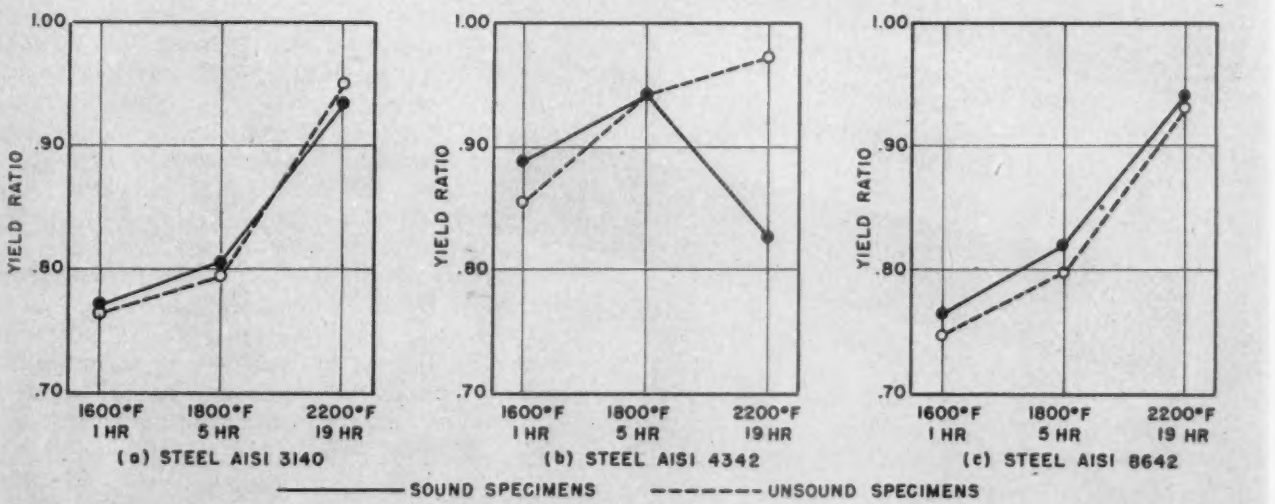
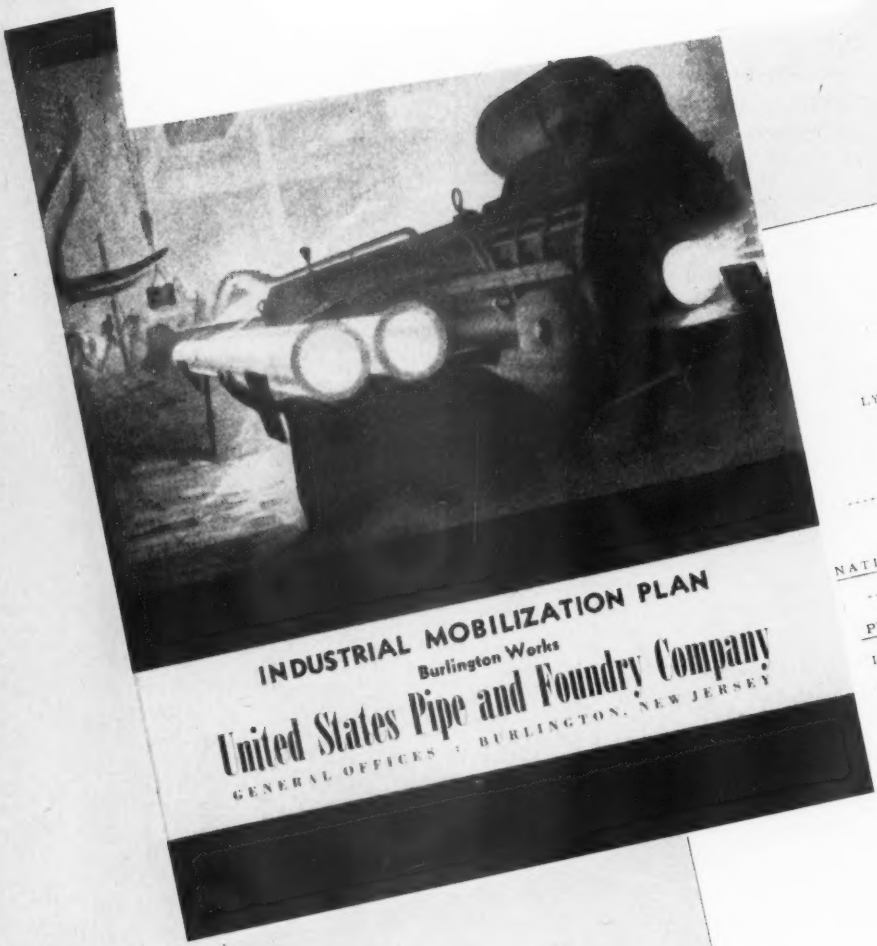


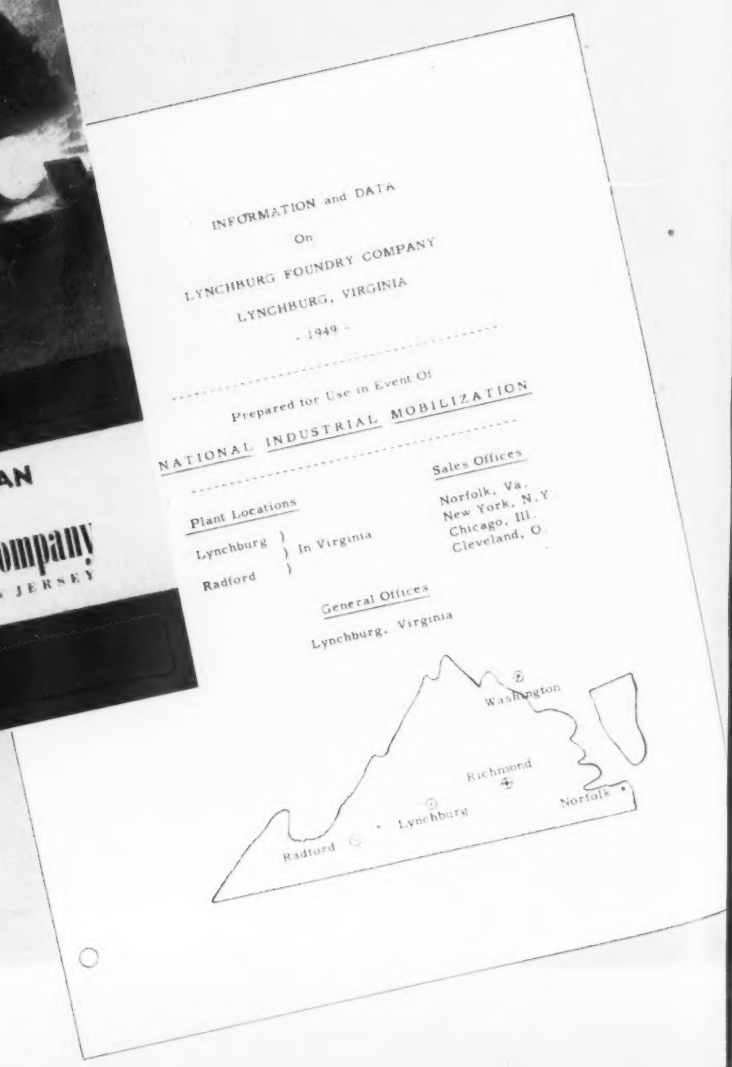
Fig. 14—Effect of homogenizing time and temperature on yield-tensile ratio of the steels

Company *Mobilization* Planning

What the Mobilization Plan Should Include

1. Purpose
2. History of the works
3. Physical data of plant: Layout, map
4. Personnel, with organization chart
5. Plant equipment
6. Monthly raw material requirements
7. Normal products
8. Description and photographs of any special products
9. Production—World War II
10. Potential


INDUSTRIAL MOBILIZATION PLAN
Burlington Works
United States Pipe and Foundry Company
GENERAL OFFICES : BURLINGTON, NEW JERSEY


INFORMATION and DATA
On
LYNCHBURG FOUNDRY COMPANY
LYNCHBURG, VIRGINIA
- 1949 -

Prepared for Use in Event Of
NATIONAL INDUSTRIAL MOBILIZATION

Plant Locations
Lynchburg } In Virginia
Radford }

Sales Offices
Norfolk, Va.
New York, N.Y.
Chicago, Ill.
Cleveland, O.

General Offices
Lynchburg, Virginia

Both the individual company and national security in general would benefit if each foundry were to prepare an industrial mobilization plan. Such a survey, as described by the author, should give a picture of how the plant's facilities and personnel can contribute to the defense effort

INDUSTRY is one of the principal elements in our national potential. No nation ever won or prevented a war merely with "potential." Actual power is required for victory, and time is needed to translate national potential into the requisite strength. Consequently, American industry must do everything possible to decrease the time of transforming itself from a peace to a war economy. There is far more than plain duty involved in this objective. Self preservation dictates to the management of every factory or plant the necessity for planning an effective way to use the resources available when war or preparation against war puts an end to business as usual.

Because of the need to disperse industry in this country in the face of the atomic bomb, the small plants will be of greater importance than in the past in maintaining our industrial capacity. For this reason, every plant has the responsibility to work out its own salvation, remembering that in the long run good management and good organization are of capital importance. Subcontracting is probably the best or even the only field for the small plants and, consequently, every effort should be made to get in touch with prime contractors. The preliminary thinking and planning may be helped by the measures suggested in this paper.

In considering the use of individual manufacturing plants in the United States for a general mobilization, we should bear in mind the experience of World War II in determining the attitudes and outlook that should govern our activities. Then, because of the natural utilization of the larger and better known industries, the manufacturing facilities of innumerable small plants were neglected. For example, an excessively large part of the potential machine tool hours of the United States was not employed during a period when the machine tool industry was unable to provide new machine tools for the expanding capacity of the larger plants. In this way, productive capacity that might have speeded up the supply of weapons, ammunition and other military equipment was not used. Moreover, the management and labor already available and trained in operating these small plants were not employed in the war effort. The human and social losses involved were even greater than the loss to the military program. The conclusion we must draw from this is the urgent need that exists for every metalworking plant—in fact, for every plant of any size—to prepare a mobilization plan by which its role in a possible war program can be effectively analyzed in time of peace.

We should realize that a number of different types of plants must be considered:

1. The manufacturer who uses the same facilities and makes the same end items as he did before mobilization, i.e., the machine tool manufacturer, the manufacturer of ball bearings and roller bearings, the paper industry, etc.

2. The manufacturer who changes from the production of a civilian item to the production of a military item but uses the same facilities with some changes and additions.

3. The manufacturer who changes from the production of a civilian item to a military item but who can do this only by setting up new facilities. We are chiefly concerned with the second and third categories.

By DONALD ARMSTRONG
President
United States Pipe & Foundry Co.
Burlington, N. J.

Productive capacity in any industry is the end result of combining physical and human factors. These may be listed as follows:

1. Machine tools and other productive equipment located in suitable buildings.
2. Raw materials.
3. Railroad and other transportation facilities.
4. Energy in the form of electricity and gas.
5. Research and laboratory facilities.
6. Labor—skilled and unskilled.
7. Management—men in administrative and supervisory positions who understand:
   - (a) Production planning.
   - (b) Production techniques.
   - (c) Training and management of a labor force.
   - (d) Quality control.
   - (e) Purchasing.
   - (f) Metallurgy and the control of physical and chemical characteristics of raw materials.
   - (g) Management control measures included in systems and procedures, such as organization, reports, etc.

We cannot forget that the real manpower problem results from spreading the available supervisory and specialist talent over expanded operations and unfamiliar jobs.

This leads to the consideration of one of the most important parts of a company mobilization plan, i.e., personnel. We are too apt to think of a company plan as a mere statement of inanimate manufacturing facilities. The plan cannot afford to lose sight of the fact that personnel is the most essential factor in the effective operation of any industry. Consequently, these plans (*Please turn to page* 238)

INSTRUMENTS

Keep Accurate Records

By MAURICE F. DEGLEY
Plant Engineer
Ferro Machine & Foundry Co.
Cleveland

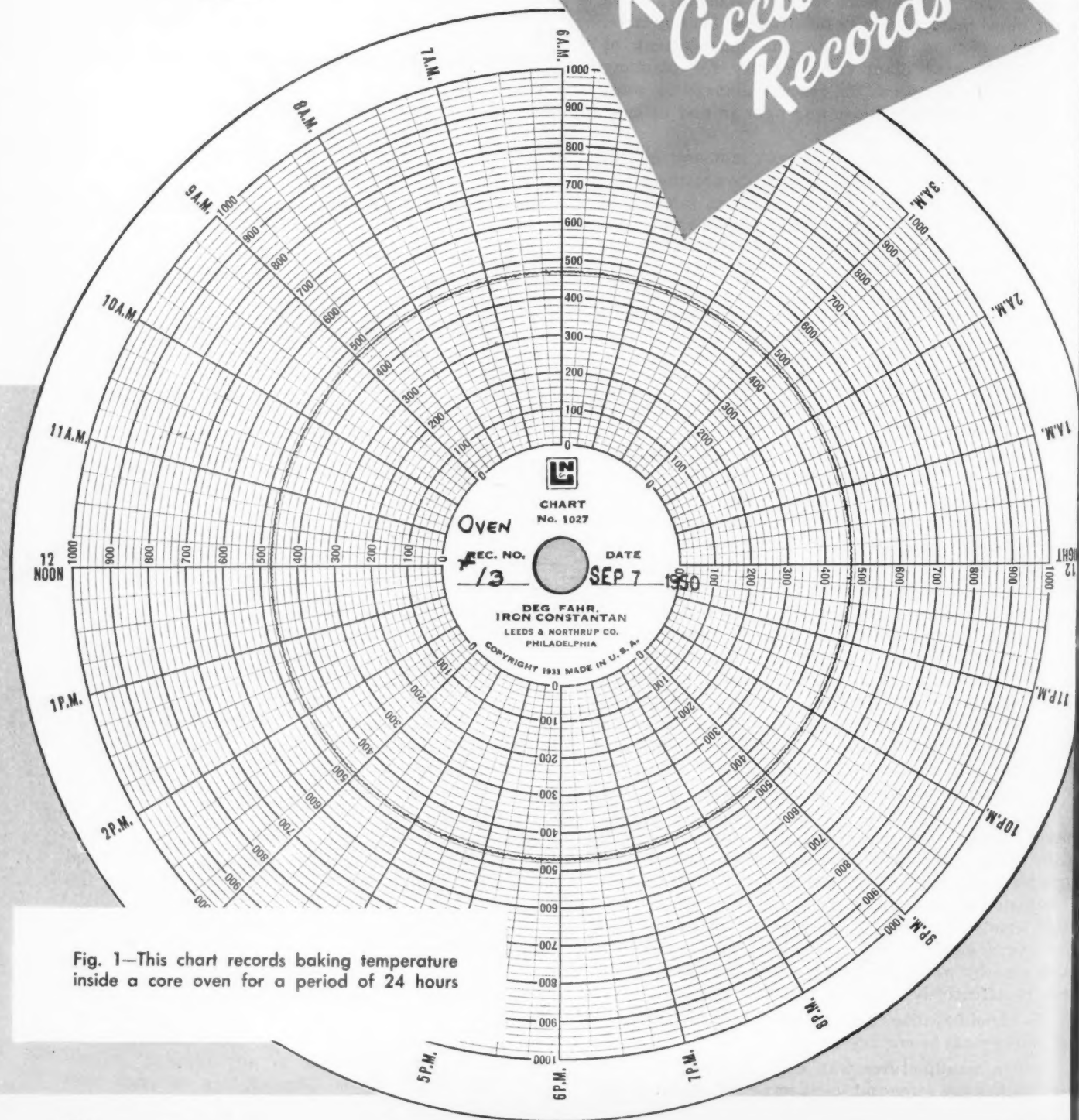


Fig. 1—This chart records baking temperature inside a core oven for a period of 24 hours

FOUNDRY operators in general are familiar with the necessity of keeping various types of records relating to such phases of castings' production as melting, molding, cleaning, etc. For example, in the melting department records are kept on the number and weight of charges placed in the cupola, and, if the latter is equipped with air pressure, volume or weight instruments, information from them may be included. In the molding department records are kept of sand properties and number and types of molds made by various operators. Similarly in the coreroom information is collected on types and numbers of core mixes used, number and types of cores produced by the coremakers, etc. In the cleaning room suitable records relating to the operations also are obtained.

Common practice in many foundries is to have the workers enter the desired information on tally sheets of some kind. At the end of the day those are picked up by the foreman or foundry clerk and taken to the office for tabulation in more permanent form. Instances are known where actual data such as the number of cupola charges, molds or cores, is chalked up on a convenient wall or board, and entered later on the tally sheets. However, with such procedures there always is the possibility that the correct information was not entered, and disputes arise when tally sheets and actual work produced are compared.

Hence, where possible it is advisable to install recording instruments which eliminate the human variable, and which provide unbiased, indisputable information on conditions existing at any given time. With those factors in mind we have installed in our foundry from time to time such instruments where the operations were amenable to that type of equipment, and have found that the installations paid for themselves in a short time. Additionally, such installations promoted better labor-management relationship since the workers soon realized that they were benefited as much as management. Since others may be interested in such installations the following brief information relating to some of them is appended:

Sand mixer operators in our foundry are paid on the basis of the number of batches produced daily. In order to record the number of batches produced by each mixer, recording ammeters located in the core department office show what the mixers are doing at all times and provide a complete record for each shift.

Data are recorded on charts like Fig. 2 which show at any given moment how many batches have been mixed during the day, and whether full or half batches are mixed. Various jobs require full batch and others only a half-batch. If an operator, by mistake, puts only one wheelbarrow load instead of two into the mixer, the mistake is brought to light on the chart since power requirements for the full load are greater than for the half load. Both management and labor

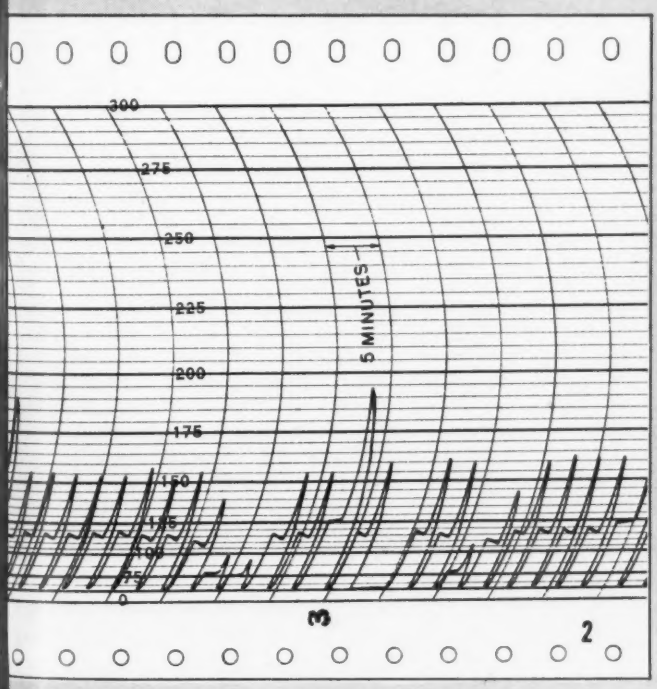


Fig. 2—Measuring sand mixer operations by recording ammeter. Long, spear-like lines show full batches of sand; short lines show half batches

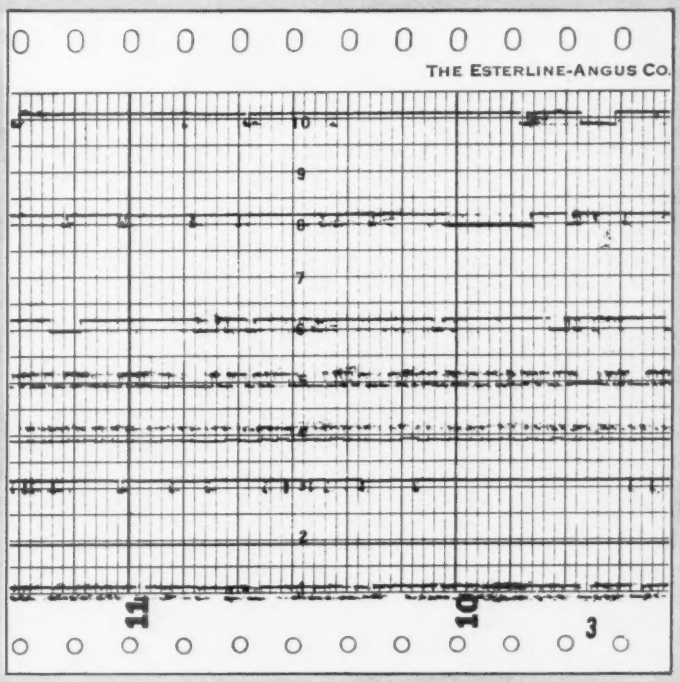


Fig. 3—Chart showing recorded movements of power molding lines. Both operating and down time are recorded continuously in this manner

are pleased with the accurate recording system in supplying indispensable information.

Down-time on production conveyor systems, from no matter what cause, is important since, among other things, it shows why hourly or daily production rates vary. To measure both down and operating time on such conveyors recording ammeters are connected to the motors operating them, and the power on-and-off conditions are recorded continuously as shown in Fig. 3. The recorder is located in the foundry superintendent's office, and the charts accurately record interruptions in conveyor operations, furnishing an extremely important record of down-time as well as running time, and the actual time of those periods. Breaks in the lines indicate nonoperation, and as each small vertical division on the chart is 2 minutes, the time easily is computed.

Temperature recording charts such as shown in Fig. 1 have proved invaluable in keeping track of baking temperatures inside core ovens and the length of time that the cores are baked. A record is kept on the chart of the actual starting time and the time that the ovens are shut off. Similar types of charts, Fig. 5, are used in the engine room to record the indoor and outdoor temperatures. Additionally a continuous record, Fig. 5A, is kept of the pressure of

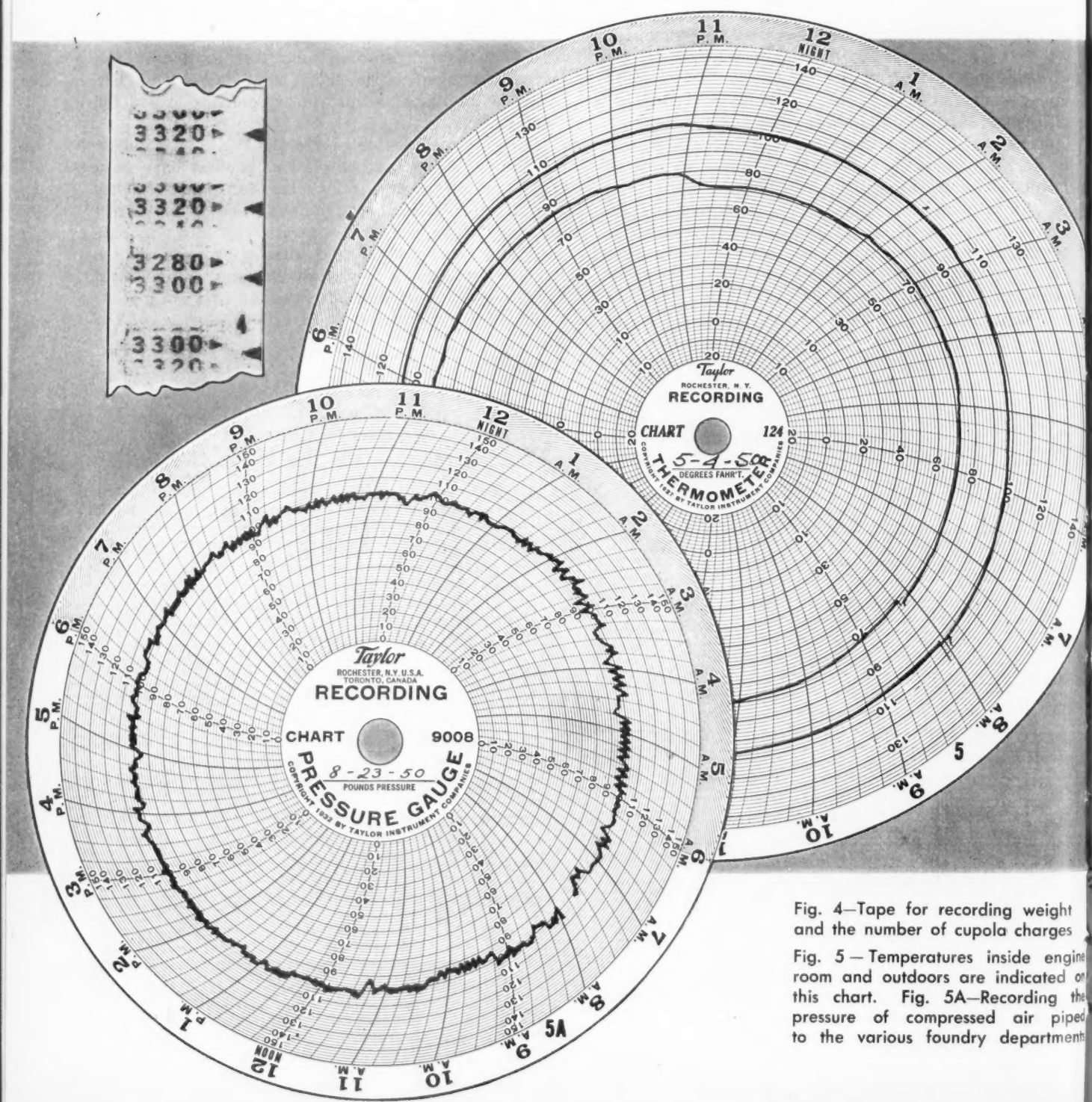


Fig. 4—Tape for recording weight and the number of cupola charges

Fig. 5 — Temperatures inside engine room and outdoors are indicated on this chart. Fig. 5A—Recording the pressure of compressed air piped to the various foundry departments

the compressed air delivered to the various foundry departments.

In operating the cupola a continuous record is kept of both the amount and pressure of air supplied. As shown in Fig. 6, amount of air is measured by volume, and beginning at 6:45 a.m. the rate was 8500 cfm until about 11 a.m. when it was reduced to 7000 cfm for ½ hr. From 11:30 until 12 o'clock (lunch hour) the blast was off. Then the air supply was turned on at 6600 cfm until 12:30 when it was increased to 8500 cfm. From 2:15 to 2:45 p.m. the wind was cut back to 7500 cfm, and then brought back to 8500 until about 4:10 when the cupola was shut down at the end of the day's operation.

Cupolas are charged mechanically by a bucket and hoist arrangement. Buckets in turn are loaded by a crane-mounted magnet. The bucket rests on a ground level scale and the weights of the various components placed in the bucket are transmitted to an elevated, large dial easily visible to the crane operator. When the bucket is loaded, the weight is recorded on a paper tape as shown in Fig. 4. By that means the number of charges and the actual weights are ascertained without question. Similarly the weights of the castings being shipped are recorded on a tape, and filed for reference.

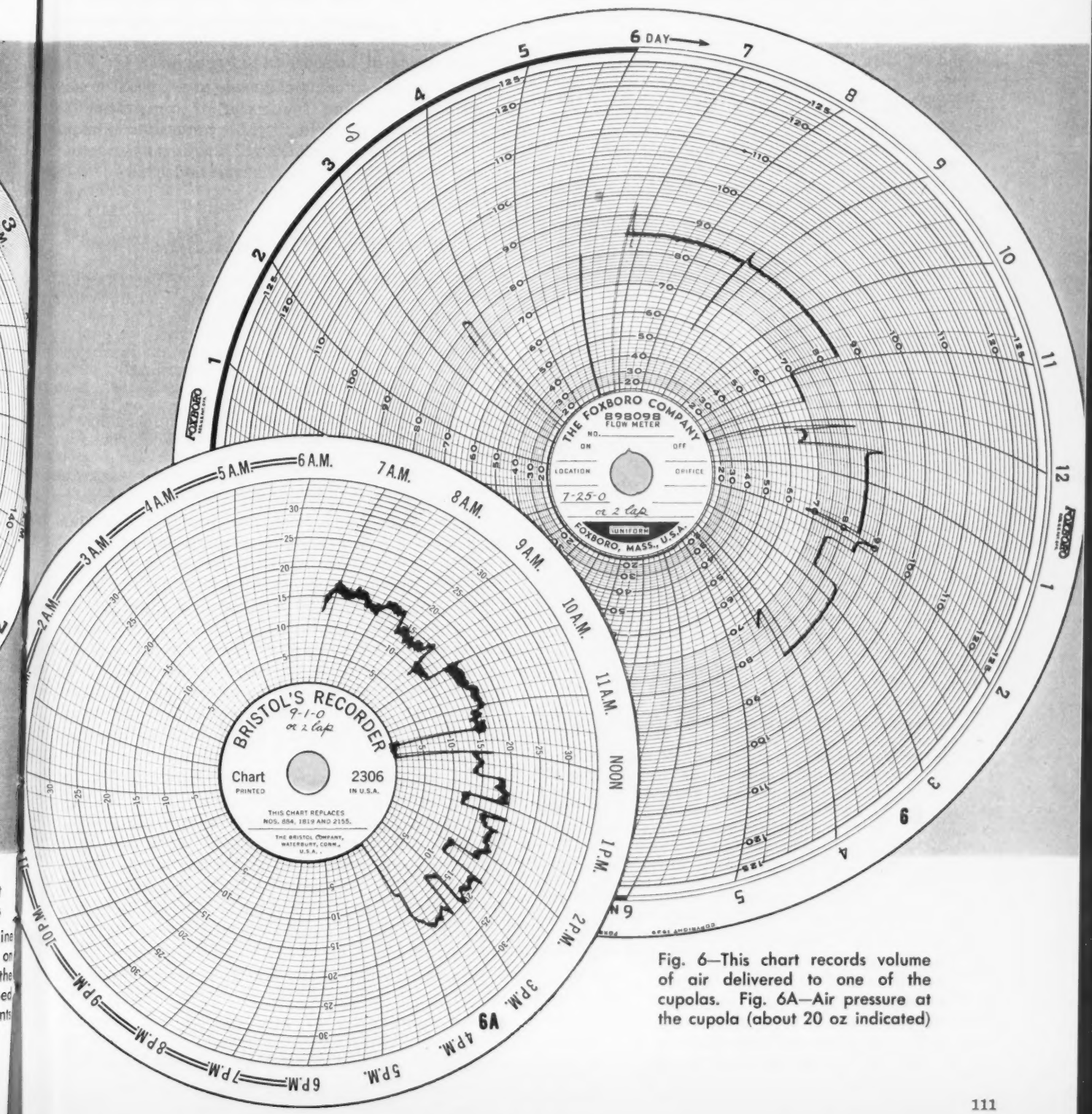


Fig. 6—This chart records volume of air delivered to one of the cupolas. Fig. 6A—Air pressure at the cupola (about 20 oz indicated)

QUESTIONS and

Annealing May Stop Cracking

Q.—A considerable number of our pulleys crack in the spokes. How can this be prevented? Also many of our thin castings are lost through missruns.

A.—In the casting which accompanied your inquiry we note that the pulley was gated into two spokes near the rim. Iron fed through the spokes kept them hot until after the hub and rim had set. Better results would follow a central pop gate on top of the hub. The rim and spokes would set while the hub was molten and still drawing feeding iron from the gate. You do not give the composition of the iron, but a visual check shows that it is close grained and the edges are chilled.

A softer iron should be poured into the castings. A higher silicon content would prevent the chilling effect, increase the elasticity and decrease the amount of contraction. These changes might be sufficient. In extreme cases it might be advantageous to place the castings in a heated furnace as soon as possible and allow them to cool slowly. This treatment would remove internal strains and improve the strength of the castings. Temperature in the annealing furnace should not go over 1000° F.

Difficulty in pouring thin castings probably may be traced to the melting practice. Under proper melting conditions you should have no trouble in getting iron hot enough for any purpose. In automobile casting plants, and many other types of foundries, thin section castings are poured from low-phosphorus iron. Skimping the coke may be at the base of your trouble. The coke bed should be high and the coke splits between the iron charges should be generous. In some instances a low-grade coke has been responsible for dull iron.

Castings Permit Gas Leakage

Q.—We supply bronze castings for the sulphite department in a newsprint paper mill. Composition is 90 per cent Cu and 10 per cent Sn which proves very satisfactory as far as acid-resisting bronze is concerned. However, recently we furnished castings for a gas accumulator in the same department, and used the same composition. Castings appeared perfect after machining, no flaws being observed, but the gas leaked through the castings so much that they had to be taken out. Castings then were tested under water with 80 psi air pressure and bubbles were numerous, showing that the castings were not suitable. Can you suggest a suitable mixture?

A.—From your description of the almost immediate leakage of the gas—presumably sulphur dioxide—through the castings, we suspect that the trouble was not due to the composition of the alloy, but rather to porosity. If the castings had been tested for pressure-tightness prior to use, the presence of porosity would have been indicated. Possibly the castings were not fed sufficiently, or more likely the alloy may have been gassed in the melting process. It may be well for you to give those two phases careful consideration no matter what alloy is being used for production of pressure-tight castings.

For resistance to sulphur dioxide gas, silicon bronze is recommended, and the range of composition is given as 1 to 5 per cent Si, 1.50 per cent maximum Mn, 5.0 per cent maximum Zn, 2.5 per cent maximum Fe, 2.0 per cent maximum Sn, remainder Cu.

Centrifugally Cast Liners

Q.—We are engaged in manufacturing centrifugally cast cylinder liners for automotive use, and have had some trouble. We use a gray iron and after casting the liners are heated to 800°C and allowed to cool in the oven. We have complaints that the liners are too soft and wear too rapidly. We accordingly would appreciate any information which would be useful to us. Specifically we would appreciate data on the following: Percentage of C, Si and Mn; advisability of using Ni and Cr; heat treating technique you suggest; advisability of using a large percentage of steel scrap in the cupola. This would be advantageous since scrap steel is cheap in our country.

A.—Centrifugally cast liners and sleeves in this country are made in a wide range of compositions, a large number of which are given in the *Alloy Cast Iron Handbook* obtainable through the book department of FOUNDRY for $4.50. All compositions given contain one or more alloying agents such as Ni, Cr, Mo, etc. For example, one analysis shows 0.4 to 0.6 per cent Mo, 0.2 to 0.4 per cent Cr, 0.2 to 0.4 per cent Ni, 2.0 to 2.20 per cent Si and 3.0 to 3.2 per cent TC. Another contains 1.80 to 2.2 per cent Ni. 0.55 to 0.75 per cent Cr, 1.90 to 2.10 per cent Si and 3.2 to 3.4 per cent TC.

With steel scrap available in quantity and at a low cost, it would appear economical for you to use large amounts in the cupola charges with suitable additions of ferrosilicon or high-silicon pig iron to bring the Si content of the final iron to the desired range, and some ferromanganese to adjust the Mn content. If sulphur content of the iron is too high, it can be reduced by a desulphurization treatment with soda ash.

Prior to machining the as-cast liners often are annealed around 1000 to 1100°F (540 to 600°C). Following machining they are heat treated, quenched and drawn. Heat treating temperature will vary according to composition and may be in the range 1540

nswers

to 1560°F (840 to 850°C) for 30 to 40 minutes (⅜-in. section). Quenched in still oil the brinell hardness will not be less than 512 or Rockwell C52. Drawing or tempering is at 350 to 370°F (180 to 190°C) for 2 hours, and the structure usually is finely martensitic possessing excellent wear resisting qualities.

As might be expected, no hard and fast rules can be given for compositions or for heat treatment. They will have to be developed experimentally based on the practices employed in your foundry including melting practices, raw materials, etc. Once the details are worked out, they should be carefully followed so that uniform products result.

Plaster Molding Details Given

Q.—Can you send us information on plaster mold casting such as methods and materials? We are trying to make castings of zinc-base alloys in small lots of 2 to 6 castings, and what we are looking for is something to fill the gap between a sand casting and a die casting.

A.—Production of castings using the plaster molding method is not difficult after some experience is gained. At the present time metal casting plasters may be purchased ready for use without any compounding. Manufacturer's directions on mixing should be followed closely until sufficient skill is developed to permit suitable variations in the procedure. In general, about 1.7 lb warm water is used with 1 lb dry plaster, and the plaster is strewn or scattered into the water. The mixture is stirred, preferably by mechanical means, until it becomes creamy, and then poured into the flask containing the pattern.

Plaster mix should be poured slowly from one edge to eliminate formation of air bubbles on the interface of mold and plaster. Flask and pattern should be vibrated during the operation for the same purpose, or a stiff bristle brush used with a vertical action over the whole pattern face.

Since plaster reproduces almost exact detail, the patterns or models must be smooth, and brass patterns appear to give best results. If wood patterns are used, they should be sanded as smoothly as possible, given two coats of synthetic resin varnish, and polished. Before pouring the plaster over them, the patterns are given a thin coating of a separating material to prevent sticking. Parting material may be lard oil, paraffin oil, soap solution, etc. One mixture found to give good results is composed of 75 per cent kerosene, 25 per cent light oil and 1 per cent wetting agent.

As plaster is an insulating agent, the gates and risers for castings may be made considerably smaller than in the case of sand castings. They may be mounted on the pattern or easily cut into the moist, but air-set plaster. After the plaster is poured over the pattern, it is allowed to stand or air-set for 20 to 25 minutes. While it still is moist it has sufficient strength that the plaster mold may be removed from the pattern with a little care. Mold after removing from the pattern must be dried to eliminate excess moisture. This is accomplished by placing in an oven at 400 to 600°F for 8 to 16 hours depending upon the thickness of the mold and the number of molds being dried. Higher temperatures decrease the time required. Molds are allowed to cool in the oven to 150 to 300°F before removal as sudden changes in temperature may result in cracking. Molds should not be allowed to become cold before pouring since they tend to reabsorb moisture.

How To Improve Sand Quality

Q.—We shall appreciate information on how to increase the strength of the sand in our aluminum foundry. At present the sand shows: Permeability 23, green sand strength 3.4, moisture 5.8.

A.—Your recent inquiry does not contain sufficient information on which to base a complete diagnosis. We might answer briefly by citing two possibilities. (1) If your sand originally was satisfactory, it may have been weakened by continued use. Some sands lose life and strength more rapidly than others. (2) If the original sand never was quite satisfactory, the best cure is to discard it and substitute a more satis-

GANGWAY!

By J. A. PATTERSON

"He's gettin' right at th' age where he wants me to play with him in his sand pile!"

QUESTIONS *and Answers*

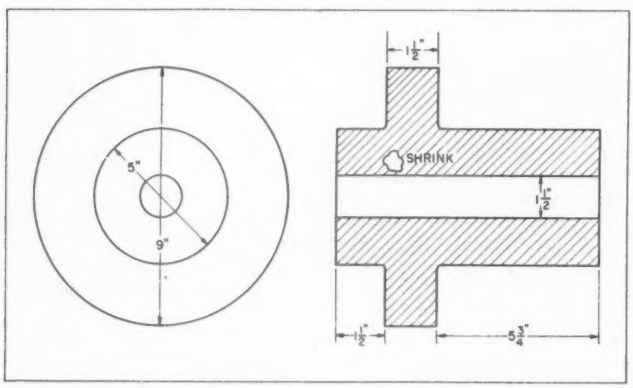
factory grade. There is no one outstanding property which can be used to determine the choice of a particular sand or sand mix.

Since it is seldom possible to develop one property to the desired degree without affecting one or more of the other properties, the selection of a sand formula usually is a compromise to obtain the best possible result from several standpoints. Two procedures are available for increasing the strength of molding sand. One is the regular addition of new sand in which the bond is high. The second is the addition of small amounts of bentonite. In one typical aluminum and bronze foundry where the sand is prepared and distributed mechanically, a small amount of new sand dumped in the shakeout gratings occasionally, and a small addition of water to the sand in the mullers, these properties are maintained: Permeability 12, green compression 5 to 6 psi, moisture content 6 per cent. Sand is from the Albany, N. Y. district and is graded as No. 0, AFS fineness 160.

Many Causes for Shrink Holes

Q.—We are having trouble with a shrink hole in a gray iron casting cast vertically and shown in the accompanying sketch. The flange is 9 in. diam, 1½ in. thick. Upper hub is 1½ in. high, 5 in. diam. Lower hub is 5 in. diam and 5¾ in. long. A 1½-in. diam core extends from the bottom of the casting to the top. We have gated this casting on the side of the flange and with a riser on top. We have gated the casting on top with a riser through an 8-in. cope, but the shrinkage defect still appears. Each cupola charge contains 800 lb oil well scrap and 200 lb pig iron with 2.80 per cent silicon content. The metal is melted in a cupola lined to 32-in. diam. We make castings ½-in. thick from the same iron which machine readily. We also make castings 5 x 5 x 40 in. These castings have draw holes at the gate and riser.

A.—Some irons shrink more than others and this is particularly true when the cupola charge is mostly scrap. The fact that your thin castings are machinable would seem to indicate that the mixture is satisfactory. However, a possibility exists that the thin castings are poured first with metal that comes mostly from the pig iron. The heavier castings then are poured from an iron that is mostly scrap. This theory of course is untenable if you tap a full charge each time into a mixing ladle and thereby get a uniform mixture. When the iron is tapped into 200 or 300-lb bull ladles the 200-lb pig iron, and 800-lb scrap mixture will not be uniform in composition.



Hard or unvented center core may be cause of shrink hole

The 5 x 5 x 40 in. castings show a draw at the junction of gate and riser with the casting because the feeding riser or risers do not feed properly. They are either too small or not sufficient in number. Under normal conditions and with a 50-50 pig iron and scrap charge the casting would not need to be fed through a riser. With the lean charge you are using the casting will need a 4-in.-diam riser near each end and another in the center. There is a possibility also that the molds are not rammed hard enough. If the walls of the mold yield after the mold is filled with iron—or any other metal—the top metal sinks more or less to produce shrunken areas. You readily can determine this point by calipering the casting up and down and from side to side and comparing it with the pattern. Some of these factors may apply to the casting shown in the sketch, but in this instance another factor is present. The center core may be too hard, or without a vent. That will cause the iron to boil in the vicinity. The boiling action will prevent the metal from setting quietly and the result is a shrinkage cavity.

Information on Cupola Blast

Q.—We wish to modify our present cupola and will appreciate information on the volume of air per minute and pressure necessary for a cupola measuring 24 in. inside diam. Also what should the total tuyere area be considering that it has eight tuyeres, the volume of the windbox, and the diameter of the windline. Ours is a continuous tapping cupola with tilting receiver. Can you tell us the advantages of the conventional cupola over ours?

A.—A cupola lined to 24 in. inside diameter will melt about 1½ tons per hour with an 8:1 iron-coke ratio, and require about 940 cu ft of air per minute. Total tuyere area should be about 20 per cent of the cross-sectional area at that zone or 90 sq in. Theoretically, the windbox is supposed to have a capacity of one second's air supply, which in this case would be about 16 cu ft, and windboxes range from 10 to 12 in. wide and 3 to 4 ft high. Hence, a windbox 10 in. wide and 3 ft high should suffice since it will have a volume of about 27 cu ft. Size of the wind line or blast pipe from blower to cupola largely is predicated on the diameter of the outlet on the blower. If the distance between blower and cupola is great or several bends have to be made in the piping, the pipe should be larger to reduce frictional air losses.

You ask what are the advantages of the conventional cupola over the one you are using, but give no specific information on wherein yours differs. You state that it has eight tuyeres, and presumably you mean there are two rows of four each. That is not

(*Concluded on page* 116)

A FEW OF THE MANY ROYERS AVAILABLE FOR proper sand conditioning

Model NC-2
12 to 15 tons per hour

The Royer Junior
4 to 7 tons per hour

Royer Sand Separators and Blenders are available in many models and capacities for the proper preparation of your molding sand. Only with the Royer do you get six point sand conditioning — (1) thorough refuse removal, (2) positive lump breaking, (3) complete blending and mixing, (4) even distribution of moisture, (5) increased permeability, (6) double aeration. More than 8,000 Royers are in use today in large and small foundries — jobbing or production—supplying properly conditioned sand for true-to-pattern molding.

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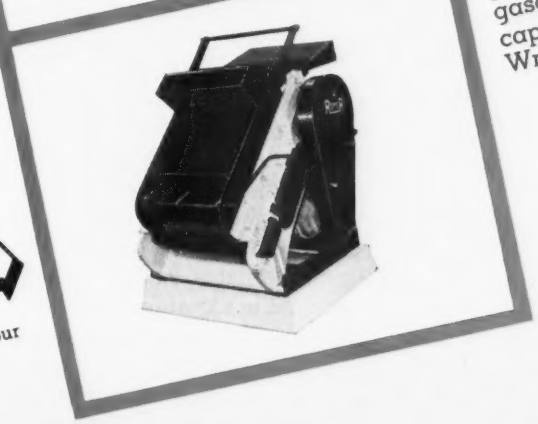
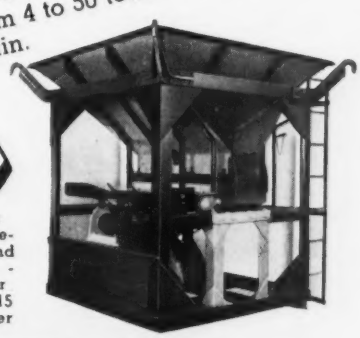
20 to 25 tons per hour



Model NRS
40 to 50 tons per hour



Combination Scrap Remover and Sand Separator-Blender Model NDC—15 to 25 tons per hour.

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.
159 PRINGLE ST., KINGSTON, PA.

QUESTIONS *and Answers*

(*Concluded from page* 114)

unusual in larger size cupolas in this country. However, two rows of tuyeres require a higher bed than with a single row, and the general practice is to use a single row of tuyeres. The only other distinction you make is that your metal flows continuously, and again that is not unusual except possibly for size of cupola. Generally in this country continuously operating cupolas are in tonnage or production foundries.

Coating Chills in Steel Molds

Q.—As operators of a foundry in Portugal we carefully read FOUNDRY every month giving special attention to the Question and Answer department, and now if possible we would like to have an answer to a question. We are producing certain steel castings which require external chills. Can you tell us if it is general practice to wash or coat the chills, and if so what material is employed?

A.—Application of a wash or coating to external chills is general practice in the steel foundry industry. Perhaps the main reason for the practice is to prevent adherence of the casting to the chill. Years ago exterior chills were coated with red lead, probably as a rust preventive, but that has not been done for a long time. Some operators use coatings containing iron oxide, but the more common practice is to coat the chills in place with the same type silica wash used for dry sand molds—silica flour with bentonite or other binder. Coating should be thin since it acts as an insulator and reduces the effectiveness of the chill. Naturally, the coating should be thoroughly dry when the steel is poured into the mold.

No Slag Analysis During Heat

Q.—In our foundry in Brazil we are operating two 6-ton basic electric furnaces and are encountering no end of trouble in regard to slags and their build-up in FeO. We are familiar with this build-up of the slag from past melting, but when we are not at the furnace almost anything can happen. Can you give us the method of determining FeO in slags and also CaC_2, and the time it takes to make these determinations?

A.—To attempt to run FeO and CaC_2 analyses while melting and refining a basic electric furnace heat is unusual to say the least since there isn't time to bother with chemical analysis of slags while making the heat. We can't imagine either, just what you mean by build-up of FeO. If you are using two slags and slagging off, the first slag is high in FeO—the higher the better—and it is taken off. Then the second slag is built up with so much lime that it should never be anything but preponderately a CaO affair, and how such a slag can build up in FeO is beyond our comprehension. As powdered coke is spread over the slag it gradually forms CaC_2, and the presence of that material is determined readily by the acetylene gas given off by a rod sample of the slag cooled in water. When CaC_2 becomes high the slag turns gray, and finally nearly black. The melter has to judge all that by eye.

If you are running one slag, it simply means that enough burned lime must be shoveled into the furnace to give a preponderance of CaO in the slag which is readily determined by color and appearance, and reduce to the desired extent with powdered coke. One-slag operation frequently means reducing the slag only enough to make it a light brown instead of the nearly pure white obtained just before the gray color of CaC_2 begins to appear.

Since you are familiar with the various phases of melting you might teach your melters to determine what is going on in the furnace by the color of the slags. One method would be to make a series of slag buttons at various stages of the heat with data on how or why the changes in color take place. These could be mounted under glass for easy inspection by the melter, and, using them as a guide, it would not be long before he could proceed on his own.

Fluxing Material Forms Film

Q.—On the small aluminum casting which accompanies this inquiry you will note that the drag face is clear and bright while the cope face is discolored and dirty. We are inclined to the opinion that a gaseous substance released on casting is responsible. This form of defect does not appear every day. We are quite satisfied the sand condition and molding procedure is satisfactory. Also the metal is poured at proper temperature. The metal is melted in oil-fired, tilting type furnaces. We use a dry flux degasser with satisfactory results.

A.—Had the casting been steel or iron poured at exceedingly high temperature we should say, offhand, the defect was a mild form of sand fusion. Aluminum is not poured at a sand fusion temperature. Your sand condition and molding procedure conform to accepted good foundry practice. With these factors removed from the problem, suspicion naturally falls on the fluxing material. The evidence is not conclusive since the material apparently serves satisfactorily as a degasifying agent. Also the defect does not follow the pouring of every heat. However, following our suspicion we should be inclined to test a few pots of metal with and without the fluxing material. Possibly, if the flux is quite fluid, some of it escapes the skimmer and is carried in with the metal stream. This small amount floats to the top as a light film and almost instantly congeals in contact with the cold sand in the cope face.

We do not know the customer's specifications for these castings, but from this distance we fail to see why the castings should be rejected. Presence of the three small tapered holes indicates that the casting is screwed to another member with the cope in contact with the other member. Also, the film is so light that a single pass across any grinding medium would remove it without affecting casting utility.

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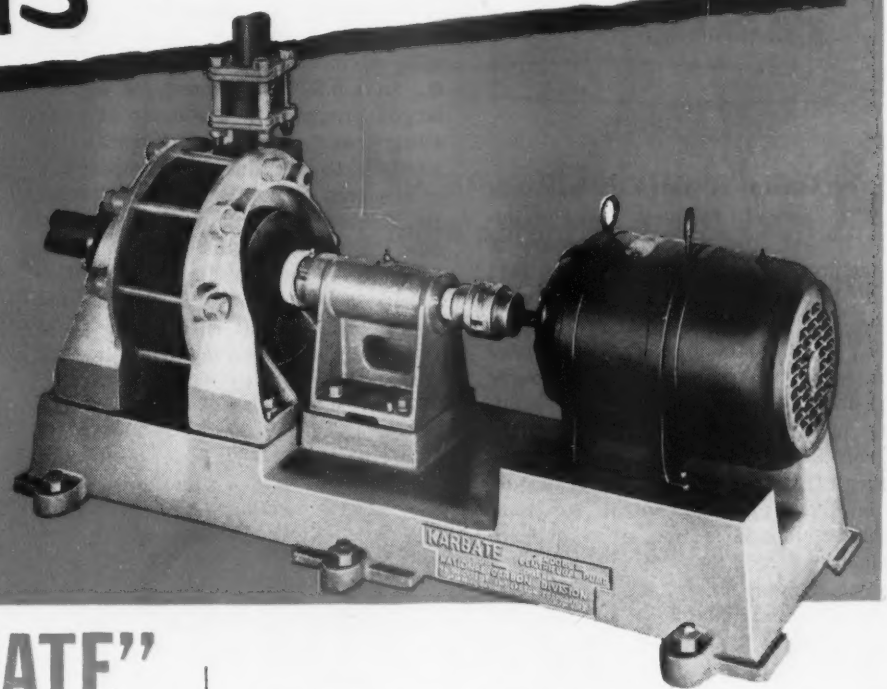

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BLAST FURNACE LININGS • BRICK • CINDER NOTCH LINERS • CINDER NOTCH PLUGS • SKIMMER BLOCKS • SPLASH PLATES • RUNOUT TROUGH LINERS • MOLD PLUGS • TANK HEATERS

MEN
of Industry

HAROLD G. LOLLEY has been named foundry superintendent, the Rosedale Foundry & Machine Co., Pittsburgh. Since 1941 Mr. Lolley has been associated with the Erie, Pa., plant, Bucyrus Erie Co., South Milwaukee, Wis. There he served a special apprentice course in molding, melting and other foundry operations, in conjunction with Penn State and University of Pittsburgh extension courses in production planning and control, foremanship, time and motion study and engineering drafting. In 1943 he became foundry supervisor in charge of machine and side floor molding and melting and 2 years later was transferred to practical metallurgy and research work in the on-the-job sand laboratory which he set up and supervised. Since 1946 he has been iron foundry superintendent in charge of the pattern shop, coreroom, foundry and cleaning departments at Bucyrus' Erie works. Active in the Northwestern Pennsylvania Chapter of the AFS Mr. Lolley has served as director and entertainment chairman.

♦ ♦ ♦

Oscar L. Olson has become president-general manager, Swedish Crucible Steel Co., Detroit, succeeding his father, the late Nels L. Olson, who founded the business 41 years ago. Oscar Olson attended University of Miami in Florida, and joined the company in 1936 as assistant chemist. Later he was transferred to the sales department where he became manager. Since 1942 he has been general manager of the company's plastic division.

♦ ♦ ♦

Alfred A. Diebold, who is serving as chairman of the Western New York Chapter of the American Foundrymen's Society this year, is works manager, Atlas Steel Casting Co., Buffalo, which he joined in 1918. He became works manager in 1942. As chairman of the Western New York Chapter he also will serve as general chairman of the convention committees for the 55th annual AFS meeting, scheduled for Buffalo, April 23-26. Mr. Diebold is active in committee work of the Steel Founders' Society of America, and has served as chairman for two terms of its Technical and Operating Group, Division 2.

♦ ♦ ♦

Dr. Bruce W. Gonser has been named an assistant director, Battelle Memorial Institute, Columbus, O., to guide development of an enlarged program in the fields of metallurgy and chemistry of metals, in addition to his duties as supervisor of research in nonferrous metallurgy. Dr. Gonser was graduated from Purdue University in 1923, took a master's degree in metallurgy from University of Utah in 1923, professional degree in chemical engineering from Purdue in 1930, and doctorate in nonferrous metallurgy from Harvard University in 1933. He joined Battelle in 1934. Prior to that he was with American Smelting & Refining Co., Superior Zinc Corp., and National Radiator Corp.

♦ ♦ ♦

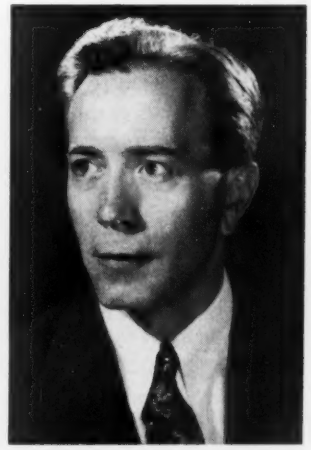
L. M. Cassidy, since 1946 vice president-sales, Johns-Manville Corp., New York, has been named president succeeding **R. W. Lea,** retired. Mr. Cassidy, who joined the company in 1926, will be responsible for five operating divisions. **Lewis H. Brown,** since 1929 chairman of the board, continues as chief executive officer. **Clifford F. Rassweiler** has been appointed vice chairman of the board, a newly created office, and will continue as vice president for research and development. **A. R. Fisher,** vice president - production and general manager of the asbestos fibre division, has been elected a director, as have Messrs. Rassweiler and Cassidy. **J. A. O'Brien,** general manager of the Industrial Products Division,

(*Continued on page* 120)

HAROLD G. LOLLEY
. . . Rosedale Foundry supt.

OSCAR L. OLSON
. . . pres., Swedish Crucible

ALFRED A. DIEBOLD
. . . heads W. New York Chapter



DR. BRUCE W. GONSER
. . . Battelle metallurgy head

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LLOYD L. STOUFFER
. . . Pangborn production chief

VICTOR F. STINE
. . . Pangborn sales-engineering

EDWARD J. METZGER
. . . ESA metals consultant

(*Continued from page* 118)
has been named a vice president. Mr. O'Brien joined Johns-Manville in 1915.

♦ ♦ ♦

Victor F. Stine and **Lloyd L. Stouffer** have been elected directors, Pangborn Corp., Hagerstown, Md. Mr. Stine, who has been with the company 38 years, and became vice president in charge of sales in 1935, has also assumed the duties of vice president in charge of sales and engineering. Mr. Stouffer, who became associated with Pangborn in 1918, since 1940 has served as secretary and assistant treasurer, in charge of accounting and procurement. He now becomes treasurer and is in charge of production operations. Executive vice president **P. J. Potter,** who has 35 years service, served as works manager in Hagerstown and since 1935 as director and vice president. He will continue to serve as vice president and director.

♦ ♦ ♦

Edward J. Metzger has been named metals consultant, Economic Stabilization Agency, Washington, where he will be concerned with problems of price control on ingots and ferrous and nonferrous castings. Mr. Metzger since 1943 had been associated with Wellman Bronze & Aluminum Co., Cleveland, where until recently he was plant manager. Prior to that he spent 13 years in bronze and copper foundry practice, working in plant maintenance and later in time study and cost work. From 1939-1943 he was superintendent of the foundry and machine shop, Falcon Bronze Co., Youngstown, O.

♦ ♦ ♦

Robert H. Owens has been elected president and general manager, Roots - Connersville Blower Corp., Connersville, Ind., succeeding the late John Avery. Mr. Owens, a graduate of Purdue University, in 1925 joined the engineering staff of the P. H. & F. M. Roots Co., predecessor of Roots-Connersville. In 1946 he became vice president in charge of engineering and manufacturing and in 1948 a director. **Ralph R. Newquist,** since 1946 vice president-sales, has been named executive vice president. A graduate of Penn State College, Mr. Newquist was previously associated with Allis-Chalmers Mfg. Co.

♦ ♦ ♦

John P. Solomon, works manager, Union Steel Castings Division, Blaw-Knox Co., Pittsburgh, has retired. Mr. Solomon joined the division as a coremaker in 1915, and served as general superintendent and assistant works manager before becoming works manager.

♦ ♦ ♦

Herbert L. Mausk has been elected vice president sales and **Ellsworth H. Sherwood,** assistant vice president sales, railway division, National Malleable & Steel Castings Co., Cleveland. Mr. Mausk, who joined the company as office boy in 1908, became general manager of railway division sales 5 years ago. Mr. Sherwood attended University of Michigan and became associated with National Malleable Cleveland Works in 1920. He served in various sales capacities and has been railway division manager of sales since 1945.

♦ ♦ ♦

Walter K. Amsbary was recently appointed chief inspector, Ashland Malleable Mfg. Co., subsidiary, Union Malleable Mfg. Co., Ashland, O. Mr. Amsbary, who attended Case Institute of Technology, was melting metallurgist, Lake City Malleable Inc., Ashtabula, O., from 1944 to 1947, when he became metallurgical engineer, Federal Foundry Supply Co., Cleveland. Previously he was associated with National Screw & Mfg. Co., and Cleveland Twist Drill Co., Cleveland, as a metallurgist.

♦ ♦ ♦

A. W. Plier has been elected executive vice president-general manager, D. J. Murray Mfg. Co., Wausau, Wis., **D. J. Everest,** vice president, and **C. L. Durkee,** director, vice president and sales manager. Other new officers recently elected include **W. A. Marquardt,** secretary, **P. W. Hoeper,** assistant secretary and **Grover Keeth,** assistant treasurer. **F. C. Boyce** is company president, **M. P. McCullough,** vice president, and **G. L. Ruder,** treasurer.

♦ ♦ ♦

John G. Bucuss, general manager, strapping division, Acme Steel Co., Chicago, was recently elected president of the Materials Handling Institute for 1951. A member of the institute since 1946, Mr. Buccus served successive terms as director, second vice president and first vice president. He has been associated with Acme Steel for 32 years.

♦ ♦ ♦

Frank W. Lampton, vice president-general sales manager, Hunt-Spiller Mfg. Corp., Boston, recently completed 25 years of service with the foundry there. Mr. Lampton became associated with the company in 1926 as a sales representative in the southwest, following nearly 20 years in railroad work. He went to Boston in 1940 as assistant sales manager, became sales manager 2 years later and vice president-general sales manager in 1946.

♦ ♦ ♦

Charles J. Cammock Jr., who for several years has been coast-to-coast assistant to sales promotion and service representatives of the Swartwout Co., has been named district

(*Continued on page* 123)

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Replace carbon usually provided by pig iron. Supply a uniform steady source of graphitic carbon. Enable better castings to be poured from 100% scrap charges. Raise carbon, thus reducing chill, shrinkage and hardness . . . increase fluidity and machinability. Easy to use.

139-A

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Both gloves are real heavy-duty types with heavier leather in the palm or work area and steel sewed seams. Leather palm extends over the heel of the hand, thus eliminating an uncomfortable bib patch while affording equal protection.

Other features of both gloves include absence of seams around index finger . . . a heavy, reinforcing steel stapled strap around thumb crotch which reduces wear at a vulnerable point . . . heavyweight safety duck cuffs with heavy tape binding and elastic on back for snug fit.

Ask your AO Safety Products Representative for the 5X284 if you prefer seams on the back of the fingers rather than on the face, as in the 5X264. Costs are equally low and the leather of both gloves is chrome tanned cowhide.

American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

(*Continued from page* 120)

manager of the northern Ohio area for the roof ventilator division. Mr. Cammock, in charge of sales and service, will maintain headquarters at the main office of the Swartwout plant in Cleveland.

♦ ♦ ♦

Dr. Bruce S. Old has been elected vice president of the consulting research and engineering firm, Arthur D. Little Inc., Cambridge, Mass. Mr. Old was graduated from University of North Carolina and Massachusetts Institute of Technology and joined the company in 1946, in charge of process metallurgy. He resigned recently as part time consultant to the Atomic Energy Commission.

♦ ♦ ♦

David White, formerly vice president, has been named president, Lester Engineering Co., Cleveland, designer of injection molding machines and die casting machines. Mr. White, who formerly practiced dentistry, joined Lester Engineering in 1940. **David Sloane,** formerly assistant to the vice president, has been named vice president in charge of engineering development. **William Schwartz** continues as chief engineer.

♦ ♦ ♦

Barry H. Fisher has been appointed sales representative, United States Graphite Co., Saginaw, Mich., with headquarters in Baltimore, in the territory comprising southeastern Pennsylvania, eastern West Virginia, North Carolina, District of Columbia and major portions of Maryland and Delaware. Mr. Fisher was graduated from the Tonbridge and Polytechnic Schools, London, and joined the company a year ago.

♦ ♦ ♦

Robert T. Griebling has been appointed executive secretary, Air Pollution and Smoke Prevention Association of America. The association, formerly in Chicago, will soon move its headquarters to Mellon Institute, 4400 Fifth Ave., Pittsburgh 13. Mr. Griebling, a graduate of University of Wisconsin, has been interested in public health problems for over 10 years. During his career he has served various industries in a public relations capacity, notably Industrial Hygiene Foundation.

♦ ♦ ♦

George H. Donaldson has been appointed vice president in charge of operations, Carbon Limestone Co. and Carbon Concrete Brick Co., Lowellville, O. Mr. Donaldson until recently was vice president-general manager, the Machined Steel Castings Co., Alliance, O. Prior to that he was in Chicago, associated with the Wood Preserving Division, Koppers Co., Pittsburgh.

♦ ♦ ♦

Milton Silverstein has been named chairman of the board of directors, Specialloy Inc., Chicago. He recently resigned as president and director, Silverstein & Pinsof, Chicago.

♦ ♦ ♦

Charles W. Beauchamp, formerly assistant sales manager, Ewart plant, Indianapolis, Link-Belt Co., Chicago, has been named assistant sales manager at Ewart, for silent and roller chain. **H. Merrill Bowman,** formerly assistant sales manager at the Pershing Road plant, Chicago, has been appointed assistant sales manager, Ewart plant, for general products.

♦ ♦ ♦

Richard C. Camp has been named assistant sales manager of the Chemical Division, Marathon Corp., Rothschild, Wis. Mr. Camp attended Columbia University, and was graduated from Rollins College. He joined Marathon Corp. Chemical Division last year. Prior to that he was assistant production superintendent at the medical gas plant, Puritan Compressed Corp., and field technician, Monsanto Chemical Co.

♦ ♦ ♦

Russell B. Weil, formerly assistant purchasing agent, Nassau Smelting & Refining Co., Tottenville, Staten Island, N. Y., has joined Franklin Metals Co., Newark, N. J., dealer in aluminum, brass, copper, zinc and other nonferrous scrap. Mr. Weil will serve as buyer and seller of metals for the company.

♦ ♦ ♦

Charles Sutton, head of C. D. Sutton Inc., Los Angeles, has been appointed representative there for Eriez Mfg. Co., Erie, Pa., to handle its line of magnetic equipment. A graduate of Armour Institute, Mr. Sutton has been associated with Allis-Chalmers Mfg. Co., Milwaukee, Industrial Appliance Co., Belleville, N. J., and Gruendler Crusher & Pulverizer Co., St. Louis.

♦ ♦ ♦

John R. Cooper and **Thomas M. Franey** have been named sales representatives in the Chicago and Duluth, Minn., district offices respectively, for Allis-Chalmers, Milwaukee. Mr. Cooper is a graduate of Kansas State College and Mr. Franey of Michigan Technical College.

♦ ♦ ♦

Russell F. LaBeau has been named vice president in charge of engineering, Sutter Products Co., Dearborn, Mich., builder of special foundry machines. Mr. LaBeau had been associated for 5 years with Ex-Cell-O Corp., Detroit, in the special machine design division.

♦ ♦ ♦

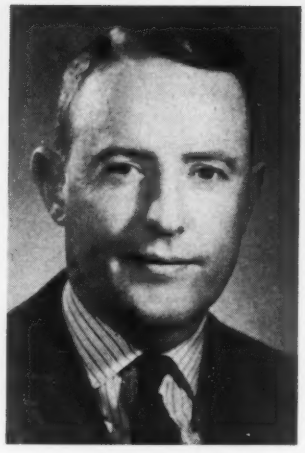
John A. Moreland Jr., formerly with Wadell Equipment Co., Garwood, N. J., has been appointed manager of the automotive castings sales division, Hunt-Spiller Mfg. Corp., Boston, succeeding Gordon L. Leach,

DR. BRUCE S. OLD
. . . Arthur D. Little vice pres.

DAVID WHITE
. . . heads Lester Engineering

BARRY H. FISHER
. . . U.S. Graphite sales

ROY F. HANCOCK
. . . joins Vanadium Corp.



STUART T. PENICK
. . . Moline manager, Link-Belt

ANDREW K. KOLAR
. . . Link-Belt sales, Chicago

who resigned. **J. William Schaeffer,** associated with the company since 1936 and head of the standards section, has been transferred to head of foundry production scheduling.

♦ ♦ ♦

Roy F. Hancock, until recently manager of eastern alloy steel sales, Carnegie-Illinois Steel Corp., Pittsburgh, has been appointed assistant to the vice president in charge of sales, Vanadium Corp. of America, with headquarters in the New York executive offices of the company.

♦ ♦ ♦

Andrew K. Kolar, formerly district manager of the Moline, Ill., plant, Link-Belt Co., has been appointed assistant sales manager of the Pershing Road plant, Chicago. **Stuart T. Penic,** who has been district engineer in Dallas, Tex., has succeeded Mr. Kolar in Moline. Mr. Kolar, a graduate of Purdue University, joined the Pershing Road plant in 1935 as a shop apprentice. Mr. Penick entered the engineering department of the Ewart plant, Indianapolis, in 1935, following graduation from University of Texas. He has served in sales and engineering at several company plants.

♦ ♦ ♦

Walter L. Davidson has been appointed sales manager for the heating department, Dravo Corp., Pittsburgh, supervising the national sales organization for direct-fired warm air space heaters. Mr. Davidson, who attended Carnegie Institute of Technology and University of Pittsburgh, has been with the company since 1942, in the engineering works and machinery divisions.

♦ ♦ ♦

Neal J. Crain has been appointed director of purchases, and **John C. Utzig,** purchasing agent, United Engineering & Foundry Co., Pittsburgh, succeeding the late G. Walter Sanborn. Mr. Crain, who attended Carnegie Institute of Technology, has been in the purchasing department of the company since 1914. Mr. Utzig joined United Engineering in 1923, served in the treasury department for 7 years, and since 1930 has been in the purchasing department.

♦ ♦ ♦

G. L. Smith has been appointed sales manager, Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown, O. **R. L. Beveridge** has been named field engineer with headquarters in Republic's Philadelphia district office, to handle industrial rubber belting, hose and molded and extruded products.

♦ ♦ ♦

George W. Starr, formerly vice president in charge of sales, Ohio Ferro-Alloys Corp., Canton, O., until his semi-retirement in 1947, has retired from active participation in the company.

♦ ♦ ♦

O. Stanley Swandahl has been appointed a district manager for Dewalt Inc., Lancaster, Pa., in Lake County, Ill., and various Wisconsin trading areas, to direct company sales of cutting machines for the woodworking, metal and plastics industries. Mr. Swandahl, a graduate of Iowa State College, has been in the building specialty field since 1945.

♦ ♦ ♦

Charles F. Alexander has been named manager of the industrial department, National Safety Council, Chicago. Mr. Alexander, for the last 5 years associated with Cherry-Burrell Corp., Chicago, until recently was assistant general manager of manufacturing there.

♦ ♦ ♦

E. H. Pritchard, vice president, Western Materials Co., Chicago, has been elected president to succeed the late Noah H. Jacobsen. The company, with which Mr. Pritchard has been associated 15 years, is a supplier of foundry sands, clays and refractories.

♦ ♦ ♦

Ernest B. Meynard has been appointed assistant sales manager, Buckeye Tools Corp., Dayton, O., maker of portable air and electric tools. Mr. Meynard has been with the company since 1942, in sales and services.

♦ ♦ ♦

Harold S. Falk, president, Falk Corp., has been re-appointed Wisconsin civilian aide to the Secretary of the Army, for a 4-year term. Mr. Falk will work with the Wisconsin military district and the Fifth Army.

♦ ♦ ♦

Edwin R. Bartlett, since 1945, president, Hooker Electrochemical Co., Niagara Falls, N. Y., has been made chairman of the board of directors. Mr. Bartlett, associated with the company since 1907, became vice president and a director in 1924. **R. Lindley Murray** succeeds Mr. Bartlett as president. He joined the company in 1916 and has been a director since 1937.

♦ ♦ ♦

Thomas A. Claiborne, service engineer, Vanadium Corp. of America, New York, has been transferred from the Houston, Tex., to the Cleveland district office.

♦ ♦ ♦

E. C. Iverson, until recently associated with J. D. Adams Mfg. Co., Indianapolis, maker of road machinery, has been appointed chief engineer, Towmotor Corp., Cleveland.

♦ ♦ ♦

Robert F. Rentschler has been named vice president, **James M. Heppenstall,** treasurer, and **Lester E. Leinbach,** secretary, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

SPO
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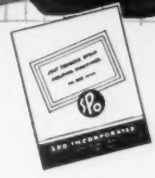
Jolt-squeeze machines (eight models) are described and illustrated in SPO Series No. 100 catalog. Post machines with swing heads and cantilever type squeezers are shown with complete specifications.

Eight models of MILWAUKEE Jolt-Squeeze-Pin Strippers are described in detail in Bulletin No. 110-A. Construction features, operating data, and production capacities are charted for reference.



Push-button operated jolt-squeeze-strip machines are described in SPO Series No. 200 catalog. Design features, automatic push-button type control, and production capacities are covered in detail.

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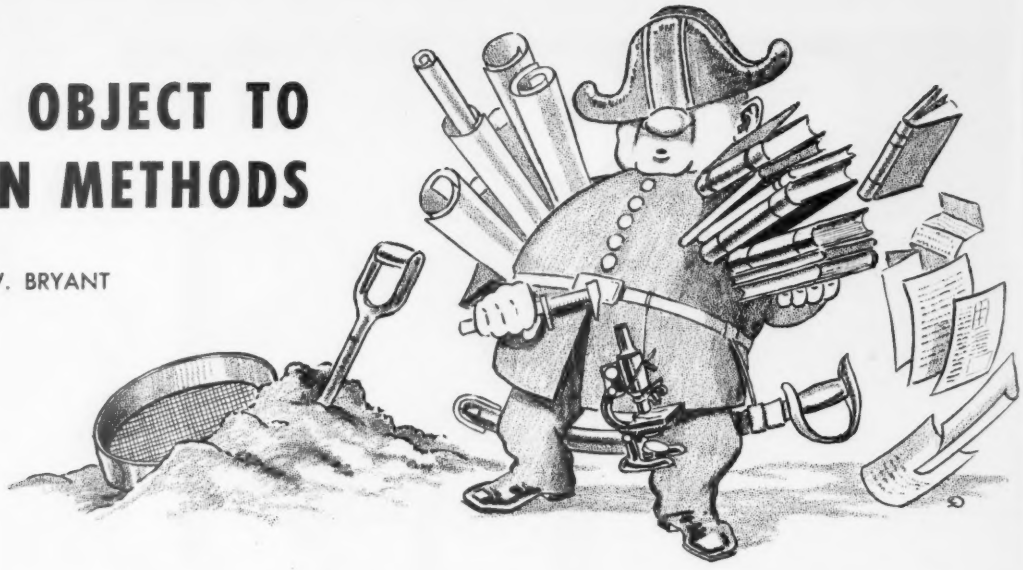
FOUNDERS OBJECT TO INSPECTION METHODS

By J. W. BRYANT



WITH some trepidation the writer ventures to point out flaws in the present Naval Ordnance Specifications and more particularly flaws in the inspection system. In times of national emergency, bronze castings will be needed in a hurry as they were on former occasions. Therefore, it is advisable —in fact, imperative—that the foundry industry attempts to revise naval inspection rules and specifications to an extent that these regulations will be a help instead of hindrance in getting out good castings.

By way of a slight digression, I have just discovered why Pat Dwyer for many years has allowed an uncouth, dissipated, argumentative character named Bill to invade his home. So long as Pat's dissertations are confined to innocent, noncontroversial subjects, he speaks for himself. When things become technical, Pat produces Bill like a magician pulling a rabbit out of a hat. It would be nice indeed and a great help if I had a familiar Bill to carry the responsibility for what I am about to say concerning naval inspection.

Quite probably the regulations governing inspection of steel, iron and other materials are just as cumbersome, obsolete and unsatisfactory as those imposed on the bronze casting industry. That is outside my field. As manager of a captive bronze foundry melting 600 tons of metal per month—metal for Naval Ordnance castings—also partially responsible for procuring many thousands of tons of castings from outside sources, I am thoroughly familiar with Navy design and inspection of bronze castings. Most of this article is based on knowledge gained during that experience.

Inspection procedure on castings made in the foundry of a prime contractor who completed the manufacture of castings into the finished product, usually was greatly curtailed and simplified. Periodically the Navy accumulated a surplus of young ensigns. Could be there just were not enough ships to put them on. Generally and unceremoniously they were unloaded on the chief residential inspector. The majority were fine, intelligent, conscientious young lads who did not deserve the title "Six Month Wonders" bestowed on them by the civilian inspection staff.

Test Bar—Ensign Ratio

The pile of test bars and analysis samples multiplied in direct ratio to the surplus of ensigns. The tonnage of report papers closely approached the tonnage of castings. However, this condition never prevailed long enough to hamper seriously the production of urgently needed castings. It lasted just long enough to get the boys in the foundry on their toes. After hasty hand shaking and farewells, everything would go back to normal. I'll never know what happened to bring this about, but it did come. Otherwise I doubt we ever would have completed the first 5-in. gun.

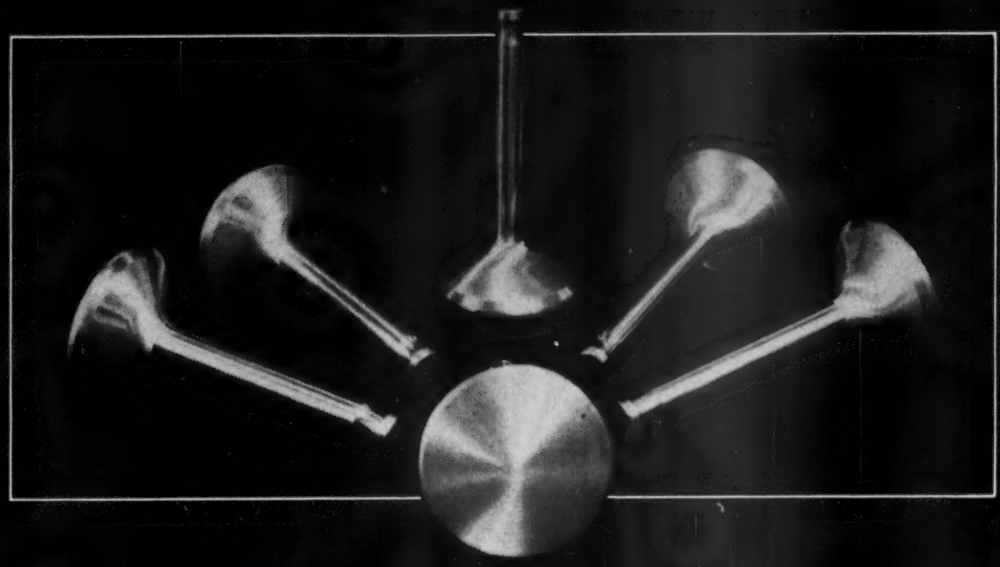
No useful purpose can be served by a resume of all the gripes of individual foundrymen about certain Navy inspectors. The subject still is thoroughly gone over whenever two or more brass foundrymen get together. As a group the inspectors were not bad fellows. They did a pretty good job considering with what they had to work. When allowed, they generally used good, common horse sense interpreting and applying rules and regulations which neither they nor the foundryman had any part in establishing. Most of them realized that what the Navy needed was castings and that the war could not be fought successfully with test bars and chemical analysis records. Almost without exception, inspectors in our plant co-operated beautifully in eliminating wasteful, useless and costly inspection procedure.

Inspectors in jobbing foundries, however, had a tendency to insist on strict application of the rules. This was particularly true where the foundry was not in the same district as the prime contractor. For instance, if the foundry was in the Chicago district and the prime contractor was in Minneapolis, the inspectors would throw the book at the Chicago foundryman. The only explanation I ever received was that the inspectors were interested primarily in keeping their own noses clean.

To the great majority of men engaged in the production of nonferrous castings, experiences during the war years in trying to furnish thousands of tons of urgently needed castings has become a hazy but still nightmarish memory. The industry as a whole can look back with justifiable pride on a job well done. While a few of the large foundries were familiar with Navy type castings and were producing them prior to the war, the great majority knew nothing about them until after Pearl Harbor. They were then awakened suddenly to the fact that they would devote their facilities and organizations to the production of castings needed by some branch of the military organizations, or go out of business.

Many soon were confronted with the problems involved in furnishing castings for Naval ordnance either as prime or subcontractors. Many

(Concluded on page 129)



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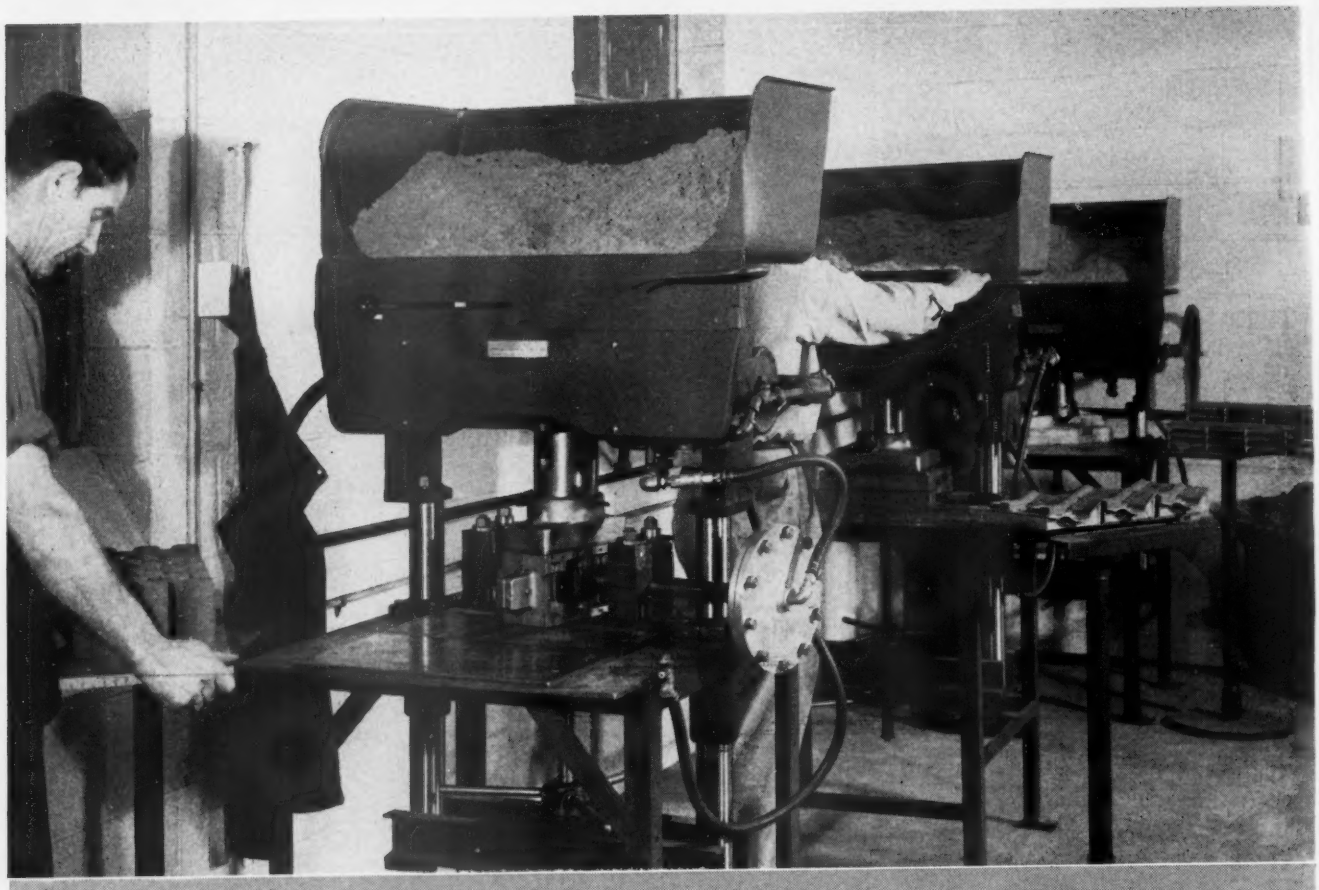
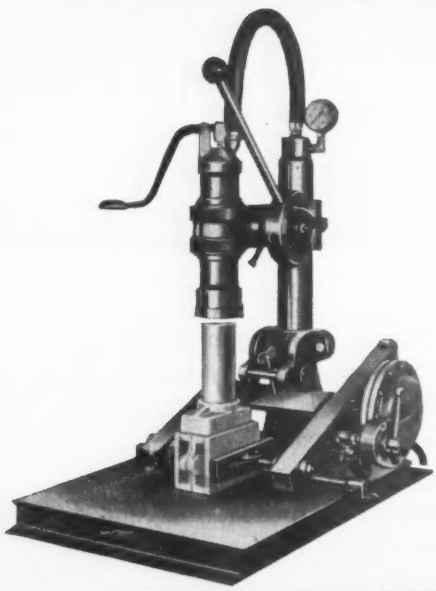


REDFORD *No. 2 Stationary Magazine Type* CORE BLOWER



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Phone KEnwood 1-8611

(*Concluded from page* 126)

of these men today admit that the job of producing good castings in quantities far beyond normal capacities of their foundries, was a tough but enjoyable experience. Making intricate and, in many cases, poorly designed castings challenged their best efforts. Undoubtedly, it was responsible for some gray hair, a notable increase in liquor consumption and perhaps a few divorces. However, they did the job and enjoyed it. Down to the present they still claim that Navy specifications and inspection rules make the production of good castings secondary to the production of good test bars.

Who wrote the Navy specifications? I don't know, but I do know they are good specifications. Every foundryman knows that there are corresponding specifications approved by the ASTM and the SAE. Chemical and physical requirements of the various alloys are not too severe and can be met by reasonably good foundry practice.

Select the Alloy

The fault does not lie in the specifications, but rather in the selection of the particular alloy specified to make a certain casting. Determination of the alloy is of paramount importance. It should be entrusted to men having not only a thorough knowledge of the physical characteristics and qualities of the various alloys, but also a complete understanding of the casting characteristics of the alloys. There should be reasonable assurance that the selected alloy will lend itself to producing a casting that will be satisfactory for the purpose for which it was intended. The foundryman who eventually must make the casting should be given some consideration at the time the casting is designed and the alloy selected.

In too many cases the all-important task of selecting an alloy for a given casting has been entrusted to young draftsmen and engineers who make their selection after a 15-minute or less perusal of their favorite handbook. Specifications chosen in this manner became part of the blueprint detailing some item that a foundry proposed to supply. If the proposal was accepted and the specified alloy approved, as it generally was, the foundry had to use it.

In some instances, manufacturers who maintained their own bronze foundries with equipment and personnel for handling alloys difficult to handle in the average foundry, succeeded in having their alloys designated for certain castings.

Generally the alloy was good from the standpoint of physical characteristics and cost. Therefore it was accepted. Manufacture of this particular item would be limited to the few firms which had an available foundry capable of producing a good casting from the specified alloy.

Selection of Navy "G" bronze as the alloy for intricate, uneven section castings for low pressure service is all too common. Navy "G" is a very fine alloy, maximum lead content 0.3 per cent, and is well suited for steam and pressure valves, gears, etc. If the strength requirements are not too severe, Navy "M" with a higher lead and zinc content and slightly lower in tin is more satisfactory. In many instances, substitution of Navy "M" for Navy "G" reduced leakers by as much as 95 per cent. This was especially true on castings with uneven wall thickness, bosses on light walls, etc.

It is not the present purpose to discuss the merits or characteristics of various alloys. We shall not venture an opinion on why Navy "M" lends itself more readily than Navy "G" to the production of intricate shaped castings. However, it may be said that it is more machinable; materials for making the ingot are more abundant, and it is less costly.

We frequently substituted Navy "M" for Navy "G". It was necessary to obtain permission from the Ordnance bureau. I am happy to say that the officials always were fully co-operative. Not much red tape was involved. However, it must be remembered that our company, a prime contractor was in position to request the change of alloy. It would have been practically impossible for a jobbing foundry or secondary contractor to make a similar request and have it granted.

Field Offices Offer Assistance on NPA Data

INFORMATION or assistance on problems relating to the National Production Authority may be obtained through the Department of Commerce Field Service. It operates field offices throughout the country. Copies of NPA orders, regulations and other NPA publications are available through offices at the following addresses:

Albuquerque, N. Mex., Hanosh Bldg., 203 W. Gold Ave.
Atlanta 3, Ga., 418 Atlanta National Bldg., 50 Whitehall St., S. W.
Baltimore 2, Md., 314 U. S. Appraiser's Stores Bldg., 103 South Gay St.
Birmingham, Ala., 319 Frank Nelson Bldg., Second Avenue & 20th St.
Boston 9, Mass., 1800 Customhouse
Buffalo 3, N. Y., 242 Federal Bldg., 117 Ellicott St.
Butte, Mont., 301A O'Rourke Estate Bldg., 14 W. Granite St.
Charleston 3, S. C., 310 Peoples Bldg., 18 Broad St.
Cheyenne, Wyo., 206 Federal Office Bldg., 21st Street and Carey Ave.
Chicago 4, Ill., 1150 McCormick Bldg., 332 South Michigan Ave.
Cincinnati 2, O., 1204 Federal Reserve Bank Bldg., 105 W. Fourth St.
Cleveland 14, O., 215 Union Commerce Bldg.
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Columbus, O., Trautman Bldg., 209 South High St.
Dallas 2, Tex., Room 1114, 1114 Commerce St.
Denver, Colo., 142 New Custom House
Des Moines 9, Iowa, 601 Securities Bldg., 418 Seventh St.
Detroit 26, Mich., 1038 New Federal Bldg., 230 W. Fort St.
El Paso, Tex., Chamber of Commerce Bldg., 310 San Francisco St.
Fargo, N. Dak., 207 Walker Bldg., 621 First Ave. N.
Hartford 1, Conn., 224 Post Office Bldg., 135 High St.
Houston 14, Tex., 602 Federal Office Bldg.
Jackson, Miss., Room 203, 301 No. President St.
Jacksonville 1, Fla., 425 Federal Bldg., 311 West Monroe St.
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Los Angeles 12, Calif., 1546 U. S. Post Office and Court House, 312 North Spring St.
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Minneapolis 1, Minn., 338 Midland Bank Bldg., 401 Second Ave. S.
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Newark, N. J., 325 Industrial Bldg., 1060 Broad St.
New Orleans 12, La., 1508 Masonic Temple Bldg., 333 St. Charles Ave.
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Providence 3, R. I., 203 Custom House, 24 Weybossett St.
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Richmond 19, Va., Room 2, Mezzanine, 801 E. Broad St.
Rochester, N. Y., 819 Commerce Bldg., 119 East Main St.
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Salt Lake City 1, Utah, 508 Post Office Bldg., 350 South Main St.
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Tampa, Fla., 307 Wallace Bldg., Annex, 608 Tampa St.
Trenton, N. J., Old Post Office Building, Room 306, East State & Montgomery Sts.
Wilmington, Del., Front and French Sts.
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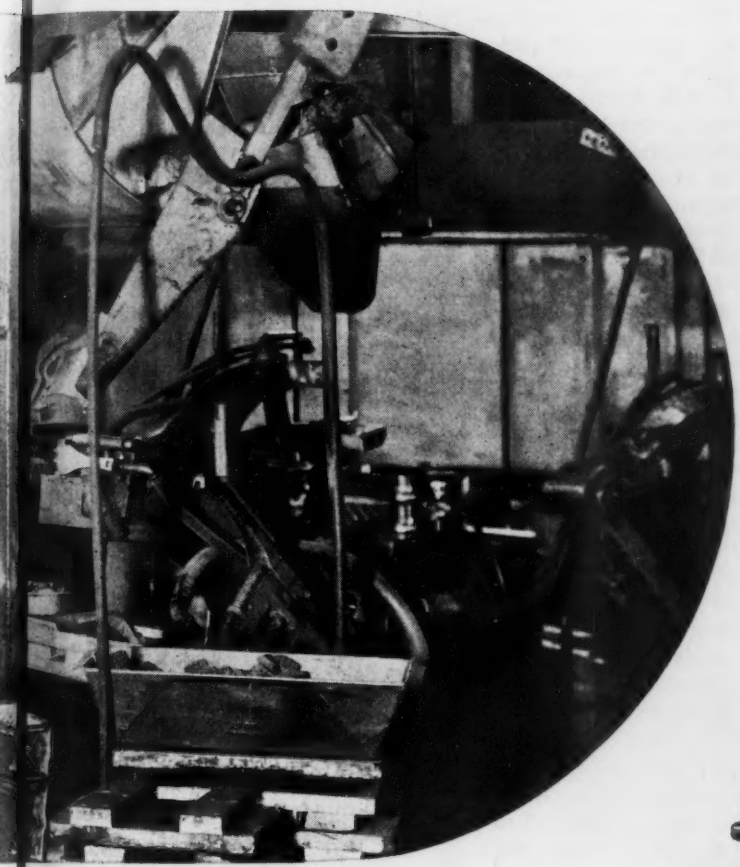
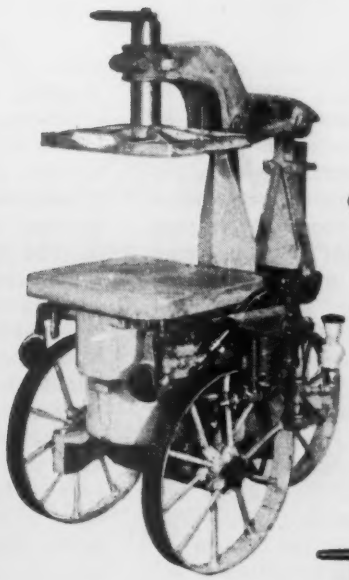
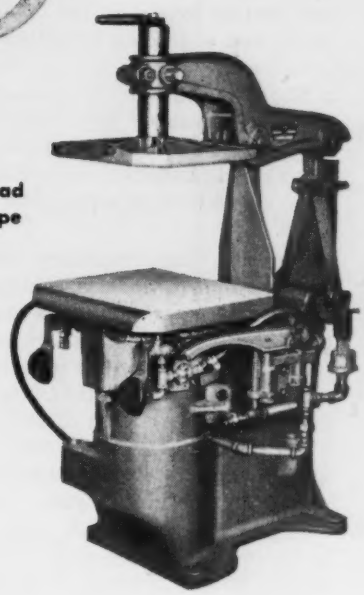
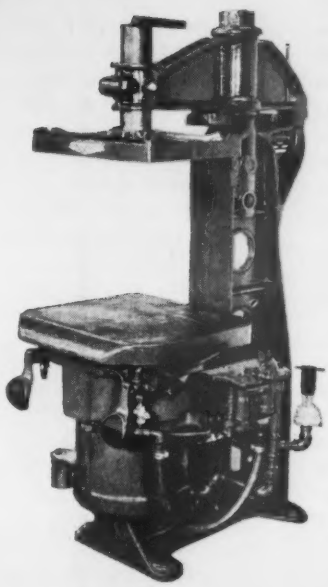




Cantilever Head
Portable Type



Cantilever Head
Stationary Type



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STANDARD EQUIPMENT

Osborn Jolt Squeezers are furnished as standard equipment, complete with Closing and Riddle Racks, Vibrator with chrome plated bore, Blow Gun and Automatic Squeeze Pressure Release Valve for automatically maintaining a predetermined squeeze pressure on each mould.

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FOUNDRY EQUIPMENT

AROUND THE COUNTRY

DETROIT — Because cutbacks in automobile production in the first quarter are not as deep as NPA officials believe advisable, further restrictive steps are being taken. The industry's production rate is down about 28 per cent from its high point of last June; nevertheless it is in excess of last year's first quarter, when Chrysler was strikebound, and makes a good showing with respect to the closing months of 1950.

Auto manufacturers have been able to get along far better than they had expected, but slashes in releases to suppliers show they know the present pace cannot hold. Foundries are feeling some of the effects already and a gradual reduction in operations for most casting shops is predicted until volume military production gets under way. Notable exception are foundries supplying machine tool builders. Operations at these shops hold at a practical maximum.

January and February saw a vast step-up in defense contract letting, including truck, tank and aircraft engine orders, which particularly require castings. Buick's $65 million contract for tank transmissions is notable. Each of these units will weigh 1½ tons with most of the weight being in aluminum sand castings. The entire housing, turbine, stator and impeller are understood to be of the light metal. This production will be centered in a 170,000-sq-ft addition now being built on Buick's foundry.

Two other novel uses of aluminum castings, automotivewise, are in the new Nash-Healey sports car introduced in mid-February by Nash, and "Le Sabre," an experimental General Motors car with engine built by Buick. The six-cylinder 125-hp, 8.1-to-1 compression ratio Nash engine employs a new-type aluminum cylinder head. Body of the car is made in England. The GM experimental car will be powered by a V-8, 300 hp, 10-to-1 compression ratio engine using premium gas and methyl alcohol. Both head and block of this engine are cast of aluminum alloys. Pistons are also aluminum alloy. Cylinder walls, however, are lined with heat-resisting cast iron. Flywheel is high-tensile bronze.

A new Chrysler engine is of particular significance to automotive foundrymen. A V-8, 7.5-to-1 compression ratio engine developing 180 hp, the engine with transmission is 8 per cent lighter at 923 lb than the 1950 in-line design. It develops 33 per cent more horsepower.

Chrysler is the first automaker to admit officially it is working with the shell molding process. Among the displays at a recent engineering preview was a pump rotor approximately 4 in. in diameter which had been cast in a plastic-impregnated shell mold. Other auto foundries put this process on their top-secret development list and prohibit suppliers from making use of any pictures of the process or of listing the parts which are being cast by it.

Gray iron and steel foundries in the area welcomed the Feb. 7 order rolling scrap prices back, but believe this must be followed with an allocation system to assure them of adequate supply at the fixed level.

A new foundry has bought the equipment and building of the Howell Foundry Co., Howell, Mich. Located at 2160 E. Grand River, the new company, Howell Casting Co., plans an expansion of the facilities which now consist of four crucibles melting about six tons of brass, bronze and aluminum a day. President is R. E. Cecil, general manager is Charles A. Hartner.

* * *

NEW YORK—Casting demand continues to expand, with most leading gray iron foundries now working six days a week. More nonferrous plants are also on such a schedule. To date the large percentage of orders is for commercial account, as differentiated from defense work. Consequently, the matter of obtaining supplies is becoming more difficult.

Pig iron is an increasing problem for ferrous foundries. Domestic supply is tight and foreign iron is not available in most cases before late April. Moreover, prices are higher than for domestic iron. Prices on most European iron of an analysis adequate for foundry use average around $70, duty paid, on cars. European iron now offered is principally from France and Germany. Some iron is also coming to this country from Chile and Brazil. New orders on South American iron are being accepted for shipment in April and early May.

Iron foundries specializing in machinery castings report a heavy demand, but are anxiously awaiting the time when machine tools will be given a preference rating so that they, as casting suppliers, can obtain priorities on the raw materials required.

Nonferrous foundries are busy, but are having their problems because of limitations on copper, aluminum and other metals.

* * *

LOS ANGELES—With work backlogs at comfortable levels and order books expanding daily, materials shortages, smog regulations and lack of skilled personnel are worrying foundrymen.

Iron scrap is plentiful but coke supplies have tightened. With offshore arrivals small, and domestic supplies scarce, the pinch for pig iron is growing. Nonferrous foundries are having trouble getting metal but shortages so far have not slowed operations. Nickel and molybdenum, with supplies of the latter cut 50 per cent are hard to find even with DO's.

For some time the Los Angeles County Air Pollution Control District and local gray iron foundries have been at loggerheads over smog regulations. Smog control here is enforced under a state law which authorizes the Control District to issue permits to install anti-smog equipment, but does not specify any particular brand of equipment. Steel and nonferrous foundries have generally complied with smog regulations but gray iron foundries generally hung back in installing anti-smog equipment because they felt available apparatus did not attack the real causes of smog, or was too expensive for their means. The position of the gray iron foundries received some support last month when

(*Concluded on page* 135)

75% FASTER

CONTROLLED MULLING OF CORE SAND

How a *Porto-Muller* increased production for STEMAC, Inc.

Mr. Carl Johnson, Plant Superintendent of Stemac, Inc., writes: "Previously our method in preparing core mix required at least 24 minutes time. With the *Porto-Muller,* this operation is accomplished in 6 or 7 minutes, *thus effecting a savings in labor and utility of 75%.*

Like many progressive foundries, Stemac, Inc., has found that a Simpson *Porto-Muller* means faster, more thorough mulling of sand and binder. ". . . core surfaces are much smoother." The result—more castings, less rejects.

The *Porto-Muller* is completely self-contained and portable. The 300-lb. capacity mixer with spring-adjusted mullers, and the 3 H.P. motor, are compactly mounted on pneumatic tires for easier handling. Simply roll the unit up to a sand pile—load—start mulling.

Let a National Engineer show you how a Simpson Porto-Muller *can boost your output.*

Complete information about the Simpson Porto-Muller is contained in Bulletin 492. Write for your copy today.

View of the Simpson Porto-Muller discharging batch into a wheelbarrow.

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THE NEW MODEL 15

Eleven ways to save man power with the new improved PRIME-MOVER

YOU know the necessity of employing every efficient device to increase production and to multiply man power. If you are planning your spending with that in mind — the new improved Prime-Mover is a machine that will help you do it.

These are the helps it can give you:

1. Moving equipment and tools; 2. Moving work in process; 3. Transporting bulk items, residue and scrap; 4. Loading and unloading R.R. cars, and trucks; 5. Snow plowing; 6. Carrying maintenance materials; 7. Yard and plant clean up; 8. Hauling liquids, concrete, aggregates; 9. Warehouse and storage carting; 10. General materials handling of loads up to ½ ton; 11. Portable power with take-off attachment. (And others that you will discover yourself.) Ask us to arrange a demonstration for you. The Prime-Mover Company, Muscatine, Iowa.

These improvements bring greater service and lower up keep!

1. Forward and reverse drive under power

2. Dependable 5 h.p. 4-cycle Wisconsin engine

3. Self-adjusting, spring loaded clutch

4. Gear driven, constant-mesh transmission

5. Positive operator control on throttle, brake, clutch

6. Turning radius only 33"

7. Bucket and platform quickly interchangeable

8. Engine and fuel tank on top rear of chassis

PUT YOUR LOAD ON A PRIME-MOVER! — *AND GO!*

(*Concluded on page* 132)

researchers found that a hitherto unsuspected, major source of air pollution was gasoline vapor losses from Los Angeles' oil industry. Then too, some equipment hailed with earlier enthusiasm is not living up to expectations.

Recently 20 gray iron foundries were refused extension of operating variances because they had not produced contracts for installation of smog-abatement equipment. High point of the action came when the operating permit of the Axelson Mfg. Co. was revoked. The company, faced with shutdown, contracted for a $25,000 temporary venturi-type scrubber unit and has appealed the denial. Currently, all but 14 of Los Angeles' 61 operating gray iron foundries are installing some kind of smog abatement equipment.

While foundries are able to meet order requirements by stepping up work schedules of present personnel, a dearth of skilled workers is certain to stymy future expansion of production. Even a general 6c increase leaves foundry pay scales far below prevailing rates in other trades. Foundrymen are apprehensive that output of district foundries, mostly jobbing shops, will suffer acutely from the labor shortage when pressure for castings grows.

* * *

CHICAGO—Reports are that foundry operations at the Aircraft Engine Division, Ford Motor Co., Chicago, will center predominately on production of magnesium castings for the new 28-cylinder Pratt & Whitney engine to be built for B-36 bombers. The plant, the World War II Dodge Chicago plant of Chrysler Corp., has twin foundries, one of which made magnesium castings and the other aluminum. Officially it is known only that all foundry facilities will be utilized. Clifford L. Wheeler, who was a member of the foundry staff of Dodge Chicago, has been named superintendent of the foundry division for Ford Aircraft. Until recently he was plant manager, Aluminum and Bronze Division, Howard Foundry Co., Chicago.

Negotiations are under way, it is understood, for reactivation of the cast armor plant in East Chicago, Ind., which American Steel Foundries built and operated for the government during the last war for production of cast armor for tanks. Operation under the same auspices seems probable. Plant has an annual capacity of 108,000 tons. Although the facility was declared surplus and offered for sale in 1946, no takers were found. For some time the government has utilized the plant for storage of many items including machine tools and dried eggs. Considerable deterioration of the property took place and the clean-up and renovation now under way will aggregate more than a million dollars.

Thefts of nonferrous metals and alloys from foundries and plating plants continue to be heard as shortages of these materials become more acute. In an effort to help police trace stolen goods of this type, Milwaukee recently proposed an ordinance which would require scrap collectors and dealers to keep records of purchases and make weekly reports to the police department. Dealers already are licensed but collectors are not, henceforth the latter would have to be. The new controls, it is believed, would make it difficult for thieves to sell their loot. Passage of the legislation has been delayed because of protests of charitable organizations which collect junk and which, under the proposed plan, would find the licensing arrangement costly.

* * *

PHILADELPHIA — Gray iron foundries now have backlogs of two months or more and steel foundries about four and a half months on an average. Malleable plants are in almost as extended a position.

Demand for steel and malleable castings is affected particularly by car building requirements, although the upturn is general. Inquiry for iron castings is diversified, and while still confined largely to commercial needs, there is some stepping up in military requirements. Currently specifications are out for one half million pieces of rifle grenades.

Most gray iron foundries are still five days a week, and in various cases are not going to a six-day week because of doubt the extra output would be sufficient to make the added costs worth while. However, these foundrymen admit they may have to step up their schedules shortly or else lose desirable business because of their own extended delivery promises. Relatively, more steel and malleable foundries are on a six-day week than the gray iron plants.

Nonferrous foundries report steadily increasing backlogs. However, they are laboring under special handicaps due to government restrictions on copper, aluminum and other metals.

Apart from inventory limitations, iron casting producers have not been affected greatly by government regulations to date. However, they will undoubtedly run into more regulations as time goes on. For instance, the matter of price control is now in its exploratory stages and eventually government price schedules will likely be set up, it is believed.

Pipe producers are perhaps the most active of all gray iron foundrymen. Their shops generally are now working on a six-day week. This applies to soil pipe as well as pressure pipe producers.

* * *

CLEVELAND—Impact of regulations concerning the draft of young men into the country's armed services is being felt by the Cleveland Trade School. Enrollment in the school's foundry classes has declined, and students who have been attending foundry sessions and who feel that the call is not far away have been dropping out to take employment in industry with the hope of earning all the money they can before entering the service.

James Goldie, trade school instructor, feels that if this trend continues, the already short supply of trained foundry workers will become even more severe, to the detriment of the foundry industry.

The recent "sickness" of railroad yardmen, with consequent stoppage of coke shipments, caused a number of gray iron foundries to shut down after the end of the last shift Feb. 8. End of the strike on Feb. 9 made the shutdown short. However, some production was lost.

Precision Metalsmiths Inc. will move from its present quarters at 6511 Cedar Ave. to a new building at 1081 East 200th St. between Mar. 15 and Apr. 1. Only seven years old, the company has grown rapidly, supplying precision cast parts to firms in this country and abroad. The new 80 x 180-ft, brick and steel building was built to Precision Metalsmiths' specifications and will be leased from the builder. It is a one-story structure with four offices, a reception room, and the balance devoted to production activities. Robert E. Miller is president of the firm.

Book Review

Encyclopedia Siderurgica, by Hugh P. Tiemann, 782 pages, translated and published by the Instituto del Hierro y del Acero, Madrid, Spain. Price 75 Ptas.

Translation of this 1933 book from English to Spanish was done by the Spanish Iron & Steel Institute. A vocabulary is included, which gives English equivalents to Spanish metallurgical terms encountered in the text. All pictures and diagrams are reproduced, and many of the tables have been converted to the metric system.

Installs Modern

CUPOLA CHARGING EQUIPMENT

A short time ago the Hajoca Corp., upon recommendations of Lansdale Monorail Systems Inc., Frank M. Weaver, Lansdale, Pa., and Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y., installed at its Quakertown, Pa., foundry, a modern and efficient cupola charging installation. This consists of a magnet handling yard crane, monorail cupola charger, pig and scrap iron make-up platform with weigh box, scale type coke and limestone storage bins with weigh hoppers, electrical transfer car and drop bottom charging buckets.

Hajoca Corp. manufactures cast iron soil pipe and fittings. Prior to installation of the new equipment, all cupola materials were handled manually with narrow gage track and cars, hand loaded, hand propelled to an elevator, moved from elevator over charging floor to cupola and then hand charged.

It is estimated that the saving in labor costs alone will meet the overall cost of this complete installation, including building alterations, in about three years, without taking into account the improved efficiency of handling. With the magnet handling yard crane it is now possible to unload a car of scrap iron or pig iron in a few hours, representing considerable saving.

At present one 72-in. ID cupola is used. Distance from spout to charging level is 28 ft and the run from point where the charging bucket is picked off the transfer car to cupola is approximately 90 ft. Length of the yard crane runway is 269 ft. Distance from ground to cupola charging monorail is 43 ft, extending out over the yard crane runway. The distance from ground to crane runway rail is 30 ft and the span of the 5-ton magnet handling crane is 32 ft 2 in.

Railroad track for incoming material is located at one end of the runway; storage of material is at opposite end of runway, with the make-up platform and storage bins approximately in the center of the crane runway.

The crane operator controls the make-up and weighing of the pig and scrap iron; the scale is located so as to be visible from the crane cab. The make-up platform, 12 x 24 ft, with scale-actuated weigh box centrally located on this platform, is capable of handling 3000-lb charges of pig iron and scrap. Additional space on the make-up platform enables the crane operator to store amounts in excess of required charge, or to use such storage to make up exact weight of charge if necessary.

The coke storage bin is 25-ton capacity and the limestone storage bin 10-ton capacity. These two bins are consolidated with centrally located control hoppers and feed into a scale weigh box for weighing required amounts of coke and stone. The crane operator loads the coke and stone bins by means of a gravity tip dump bucket; bins, which are loaded in advance, have sufficient capacity for more than a single day's requirement.

Two drop bottom Shepard-Niles charging buckets are employed. An empty bucket is placed on an electrically operated transfer car which shuttles back and forth under iron, coke and stone hoppers. Air-operated discharge gates drop predetermined weights of each commodity into the bucket, which is then ready for hoisting by the cupola monorail charging

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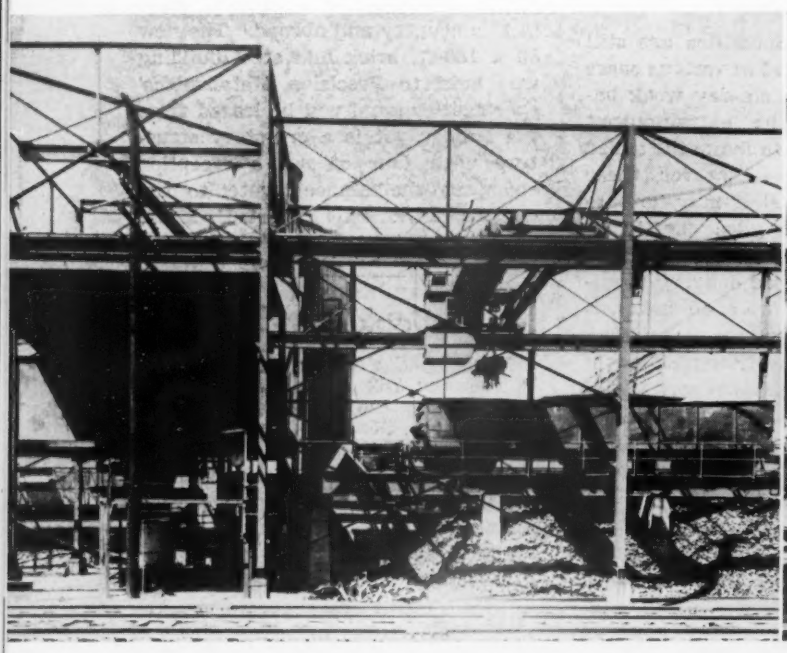


Fig. 1—Raw material yard showing coke and limestone bins, iron make-up platform, cupola monorail

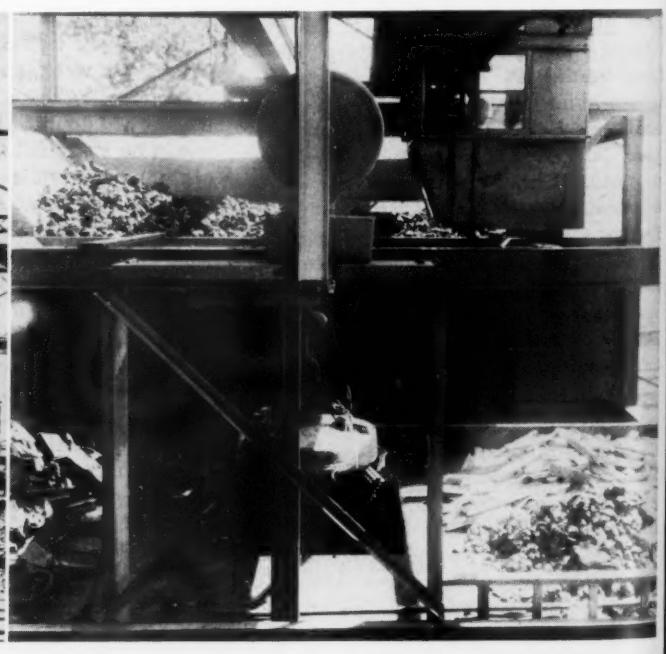
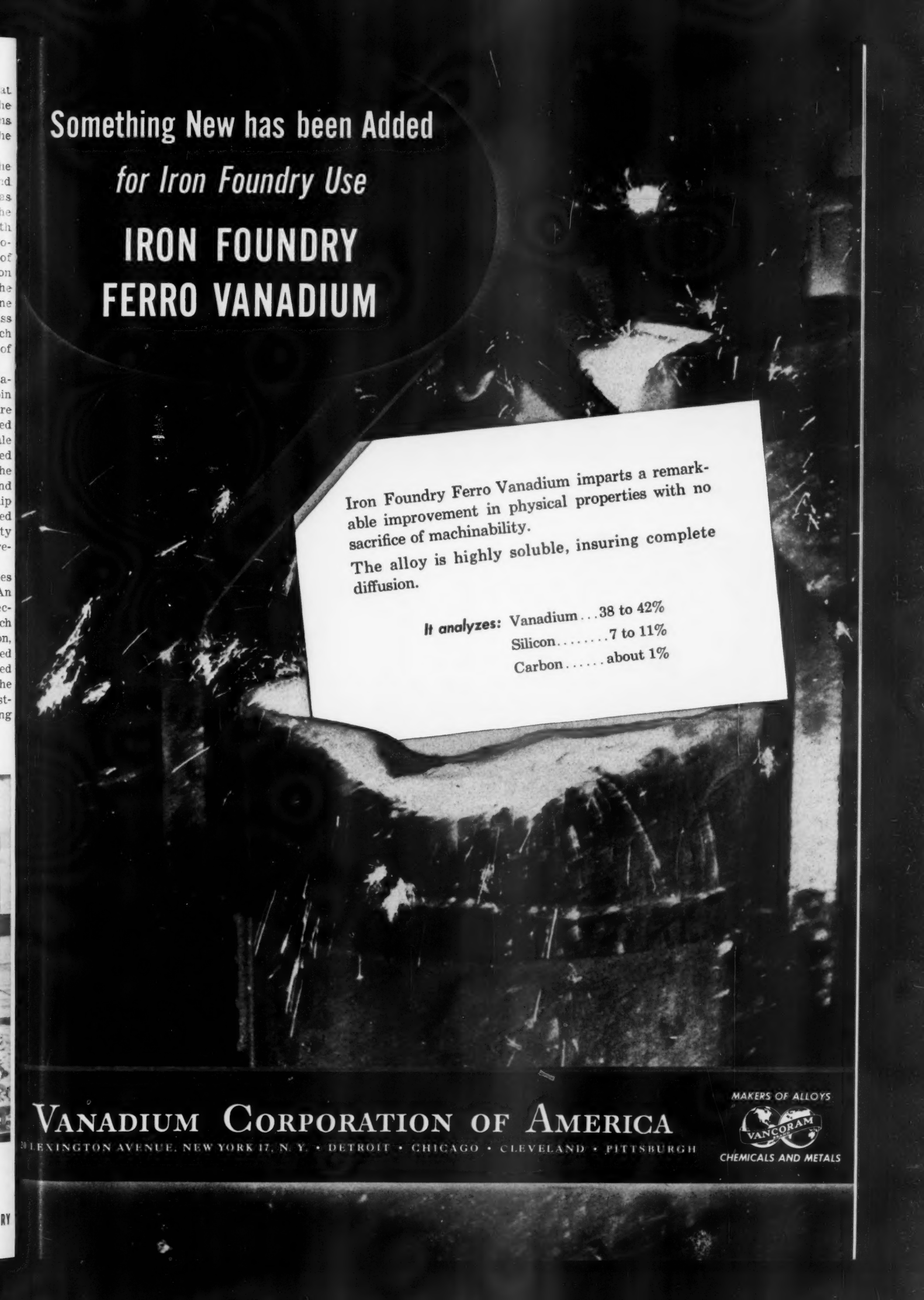


Fig. 2—Crane discharging material into weigh box. Scale visible to crane operator in weighing charge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Iron Foundry Ferro Vanadium imparts a remarkable improvement in physical properties with no sacrifice of machinability.
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MAKERS OF ALLOYS
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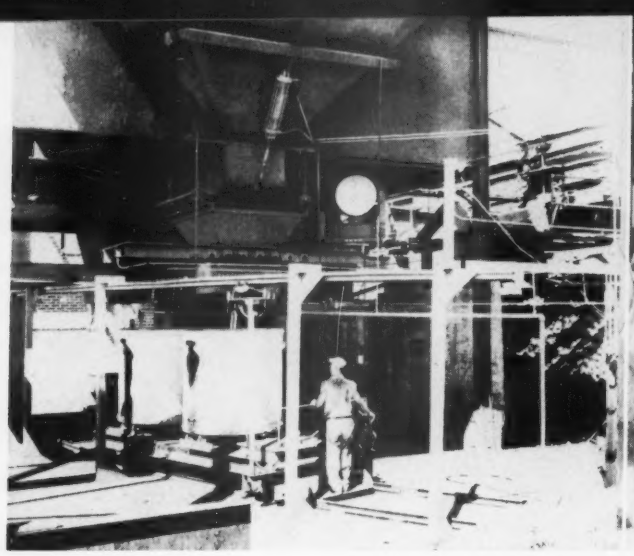


Fig. 3—Transfer car being operated under weighing bins on way to monorail hoist for cupola charging

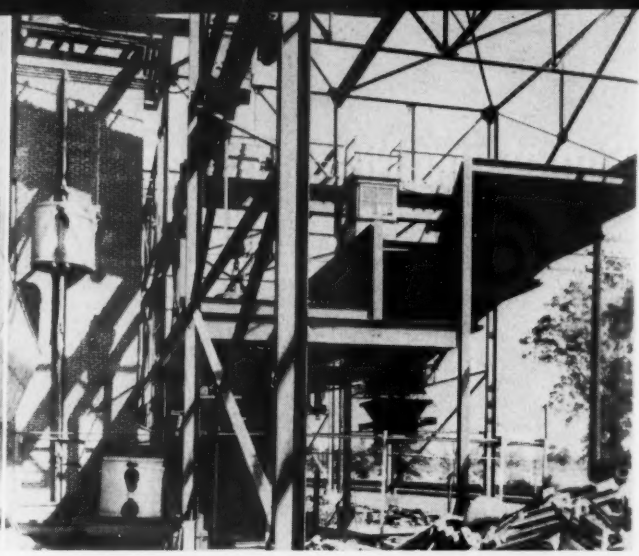
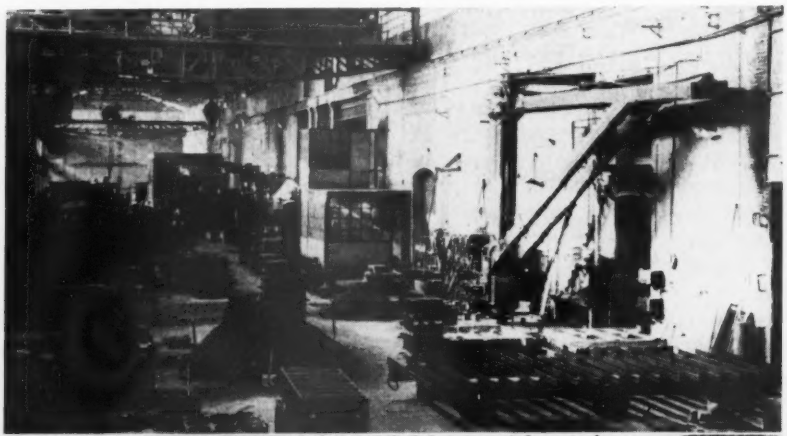


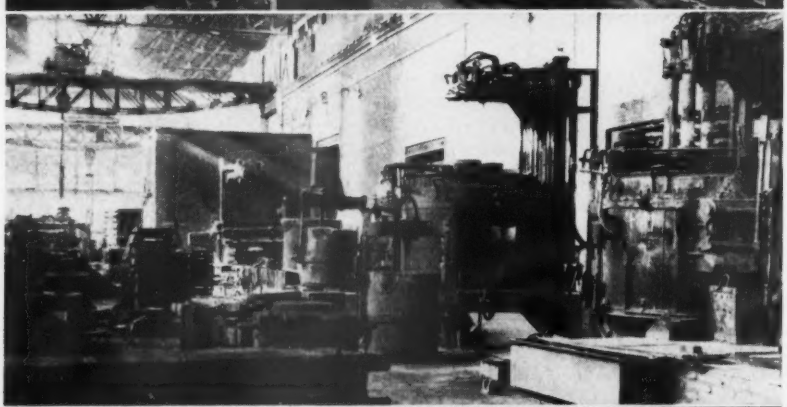
Fig. 4—View showing yard crane, storage bins, scales, transfer car, charging buckets and charger

(*Concluded from page* 136)

hoist. The latter deposits another empty bucket on the transfer car prior to hoisting a loaded one.

Success of this initial installation has prompted the Hajoca Corp. to contract for practically a duplicate layout to be installed at its other foundry at Lansdale, Pa.





Spanish Foundries

By PROF. F. R. MORRAL
Department of Materials Engineering
Syracuse University
East Syracuse, N. Y.

DURING a visit to Spain a short time ago the author found time to visit a few foundries between speaking engagements. Operating conditions in the industry are somewhat difficult, due mainly to the short supply of raw materials and electrical power, and to general industrial and economic conditions.

With a population of approximately one-fifth that of the United States, Spain produced some 470,000 tons of gray iron castings in 1949. This was approximately 4½ per cent of gray iron castings shipments by foundries in this country. Further indication of the size of Spanish metalworking industry can be gained by 1949 figures showing production of pig iron

(*Concluded on page* 141)

Views of the melting room (center) and two molding floors of Fundiciones Escorsa, S.A., Barcelona, Spain, are shown at left

Clean metal is a "must" for the best castings.

Famous CORNELL CUPOLA FLUX

Makes IRON
Clean
Hotter
More Fluid.
Sulphur is Reduced
Keeps Slag Fluid

• SAVES MANY TIMES ITS COST BY MINIMIZING CASTING MAKE-OVER TIME AND LABOR

Experience has convinced leading foundries that the most careful selection of pig, scrap, limestone, etc., is not enough to ensure better castings, because impurities still exist in the molten iron.

Famous Cornell Cupola Flux purges molten iron of impurities so that only clean metal reaches the molds, resulting in sounder, cleaner castings with definitely easier machinability.

Famous Cornell Cupola Flux also ensures more efficient cupola operation and greatly reduces erosion of brick or stone linings. By prolonging lining life and keeping cupolas cleaner, it greatly reduces maintenance time and labor.

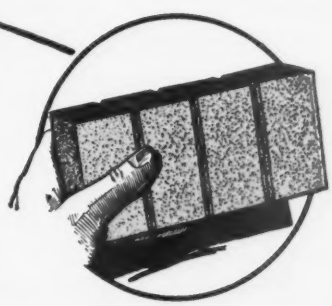
•

MANY ORDERS FROM MALLEABLE FOUNDRIES, with cupola operation, prove that this industry, too, recognizes that Famous Cornell Cupola Flux gives their castings a much better start.

WRITE FOR BULLETIN NO. 46-B

Pre-measured SCORED BRICK FORM *takes but seconds to use.*

You simply lift Famous Cornell Cupola Flux out of container and toss it into cupola with each ton charge of iron, or break off one to three briquettes (quarter sections) for smaller charges, as per instructions. Furthermore, this flux does not blow out with the blast but STAYS in melting zone until entirely consumed, insuring fullest efficiency.



Famous CORNELL ALUMINUM FLUX

CLEANSES MOLTEN ALUMINUM so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive Formula greatly reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

The CLEVELAND FLUX Co.
1026-1040 MAIN AVENUE, N. W.
CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum Flux Since 1918

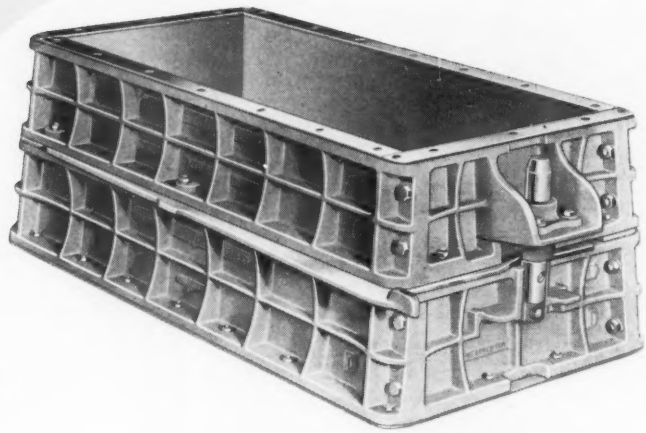
FAMOUS CORNELL FLUXES
Trade Mark Registered

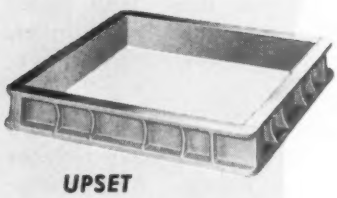
Famous CORNELL BRASS FLUX

CLEANSES MOLTEN BRASS even when dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves you considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

FOR FAST, EXACTING PRODUCTION

Fremont heavy duty magnesium slip flasks . . .





UPSET

Built to withstand long, continuous usage in machine molding, yet one-third lighter with twice the tensile strength of aluminum. Solid, bolted and welded corner construction. Steel faced top and bottom flanges. Accurately machined inside surfaces and flanges.

The 1" dia. hardened and ground GROOVLOCK FOOLPROOF PIN assures perfect alignment indefinitely and is particularly adapted to cope or drag pattern jobs. Other types of standard pin fittings if desired.

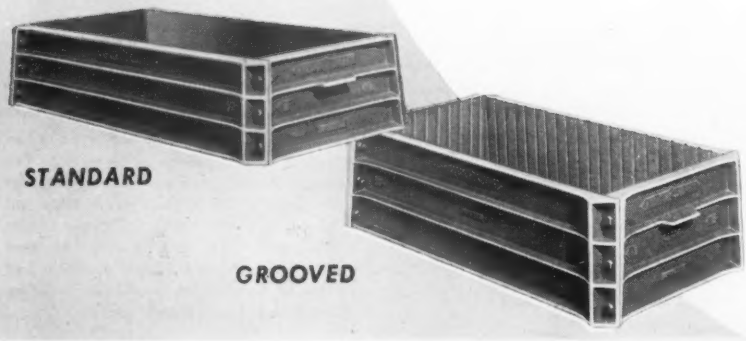
FREMONT CAST IRON OR CAST ALUMINUM JACKETS

Bolted corner construction, precision machined and drilled. Inside surfaces rough disc ground. Jackets ordinarily scrapped because of broken ends and sides can be salvaged at slight cost by removing a few bolts and inserting a new replacement side or end casting.

Two styles—the standard for ordinary foundry practice and the grooved for steel foundries. The ribbed construction permits ready gas escape.

Fremont flasks and jackets can be assembled on a 3°, 4° or 5° taper.

All orders given prompt attention.



STANDARD

GROOVED

The Fremont flask co.

FREMONT, OHIO

(*Concluded from page* 138)

at 600,000 tons and steel at 730,000 tons.

One of the foundries visited was Fundiciones Escorsa, S. A., of Barcelona. This plant produces castings and finished machined parts for railroad, mining, marine, cement, chemical, automotive, electrical, and other industries.

The company started in 1876, melting gray iron in the cupola. In 1905 converters were added to produce steel. Later additions included electric furnaces and a machine shop. At present the plant occupies some 28,000 sq yd, of which about half is under cover in buildings. Melting equipment includes two cupolas of 5 ton per hr capacity and one rated at 2 tons per hr. They are charged with hydraulic hoist equipment. Additional melting equipment includes three automatically controlled electric furnaces of 0.75, 1.5, and 2 tons capacity and a side-blow converter of 2 tons capacity. Heat treatment is done in three oil-fired furnaces.

Sands are prepared in eight mixers. Machine molding is done on eight hydraulic and two compressed air operated machines. Cores and molds are dried in five coal-fired ovens.

Melting and pouring of large and small castings is segregated into two buildings, one 50 x 430 ft and the other 60 x 430 ft. A separate small building houses sand preparation equipment, and cleaning and inspection of castings is done in another 45 x 330 ft building. The machine shop houses miscellaneous equipment, some of sufficient size to turn flywheels up to 12 ft in diam.

A chemical and metallurgical testing laboratory is maintained for control of raw materials, production activities, and finished products. It is equipped with a machine for tension and flexure tests, a Charpy impact tester, a metallographic microscope, and hardness testers, including a Rockwell tester of modified Spanish design.

Yearly production at the foundry is approximately 550 tons of gray iron castings, 518 tons of steel castings, and 28 tons of steel ingots for rolling and forging. That is believed to be only 20 to 25 per cent of capacity for this plant, which employs some 200 workers.

Electric power is available to the foundry only four or five days a week. Scrap is scarce and of inferior quality. Coke in the foundry yard has considerable sand mixed with it. Better quality materials are available but at prices which would make foundry operations unprofitable.

The author also visited a foundry near Santander. It is an integrated iron and steel mill, the S. A. J. M. Quijano, which is engaged mainly in making steel wire and its products but maintains a ferrous and nonferrous foundry to cast parts for remodeling and repairing old equipment. The plant was unable to purchase new equipment abroad for its modernization because of shortage of foreign exchange. Nonferrous metals are melted in gas-fired furnaces and ferrous metals are melted in one of two electric furnaces—an arc furnace of 2 tons capacity and a smaller induction furnace.

Molds are made by hand, and techniques are being developed for greater use of unskilled labor for molding work. Cement bonded sand is used for molds in this foundry.

At Torrelavega the author visited a specialty foundry set up for mass production according to Spanish ideas. Molds are prepared during the day by young, unskilled boys using metal patterns. Metal is melted at night in a 1-ton electric furnace, and two or three pourings made, if electric power is available.

Meetings of Interest to Foundrymen

Mar. 2—Malleable Founders' Society, eastern sectional meeting, Hotel Commodore, New York

Mar. 5-9—American Society for Testing Materials, committee week, Netherland Plaza Hotel, Cincinnati

Mar. 9-10—Ohio Regional Foundry Conference, sponsored by Ohio Chapters and Ohio State University Student Chapter of AFS, Case Institute of Technology, Cleveland

Mar. 19-21—Steel Founders' Society of America, annual meeting, Edgewater Beach Hotel, Chicago

Mar. 19-23—Western Metal Congress & Exposition, Civic Auditorium, Oakland, Calif.

Mar. 23—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Apr. 2-4—American Institute of Mining and Metallurgical Engineers, National Open Hearth Conference, Cleveland

Apri.. 19-20—Malleable Founders' Society, Market Development-Mobilization Conference, Rensselaer Polytechnic Institute, Troy, N. Y.

Apr. 23-26—American Foundrymen's Society, annual convention, Buffalo

Apr. 27—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Apr. 30-May 4—Material Handling Institute and American Material Handling Society, exposition and conference, International Amphitheatre, Chicago

May 18—Malleable Founders' Society, eastern sectional meeting, Hotel Commodore, New York

May 23-24—American Society for Quality Control, annual convention, Hotel Cleveland, Cleveland

May 25—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

June 4-6—French Foundry Association, foundry congress, Paris, France

June 12-15—Institute of British Foundrymen, foundry congress, Newcastle-on-Tyne, England

June 18-22—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hotel, Atlantic City, N. J.

June 21-22—Malleable Founders' Society, annual meeting, the Homestead, Hot Springs, Va.

July 27—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Sept. 10-14—International Foundry Congress, Brussels, Belgium

Oct. 15-19—American Society for Metals, annual meeting and exhibit, Michigan State Fair Grounds, Detroit

Oct. 25-26—Gray Iron Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago

Oct. 31-Nov. 2—Foundry Equipment Manufacturers' Association, annual meeting. The Homestead, Hot Springs, Va.

Nov. 7-9—Mechanite Casting Manufacturers, annual meeting, the New Yorker, New York

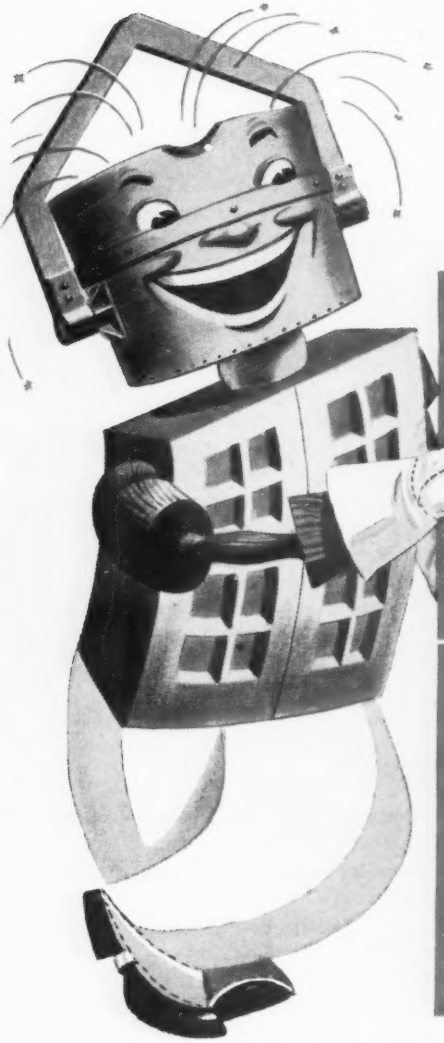
Nov. 7-9—National Foundry Association, annual meeting, Shoreham Hotel, Washington

Dec. 6-8—American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Hotel William Penn, Pittsburgh

Charley the Core-Maker Says:

SAVE TIME with KRAUSE CEREAL BINDERS

- **Get Greater Flowability**
- **Produce Finer Detail**
- **Reduce Finishing Time**



MORE GREEN STRENGTH: In both green and dry core stages there is greater binding strength with Truscor and Amerikor — they supply the needed green bond and strong affinity between sand granules.

FINE FLOWABILITY AND TEXTURE: The uniform quality of Truscor and Amerikor insures quicker mix — easier blending — less sticking — uniform ramming — increased permeability.

FINER DETAIL: Smooth surfaces—sharp, unbroken edges — less scabbing, cold shut, buckling — because Truscor and Amerikor are scientifically processed to provide these advantages.

EASY, BURN-OUT COLLAPSIBILITY: Because cereal binder burns out rapidly and completely during casting, you are sure of ready collapsibility and easy shake out when you use Truscor or Amerikor.

For better, lower-cost cores, place a trial order for Krause Cereal Binders now — Truscor, if you like a light weight binder; Amerikor, if you prefer a heavier weight. Call any one of the distributors listed below or write us direct.

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SOME APPLICATIONS OF GEOMETRY IN THE PATTERNSHOP

From time to time the patternmaker has occasion to lay out various types of geometrical figures, and the following information will be of value in speeding the work. Fig. 1 is a heptagon or seven-sided figure whose angles at the center are 51° 25.8′. The angle formed by the adjacent sides at C equals 128° 34.2′. Multiplying the radius R by 0.8676—in column 5 of Table I will give the length of a side as at B in Fig. 1. Multiplying the length of a side D, Fig. 1, by 1.0383 in column 6 of Table I will give R in Fig. 1, and the angles to hold the work in cutting the ends of the segments under column 7 Table I is 64° 17.5′, and is shown in Fig 2.

Referring to Table I, the 51° 25.8′ is obtained by dividing 360° by 7 which equals 51.43°. Since 0.43° equals 25.8′, the answer is as previously indicated, 51° 25.8′.

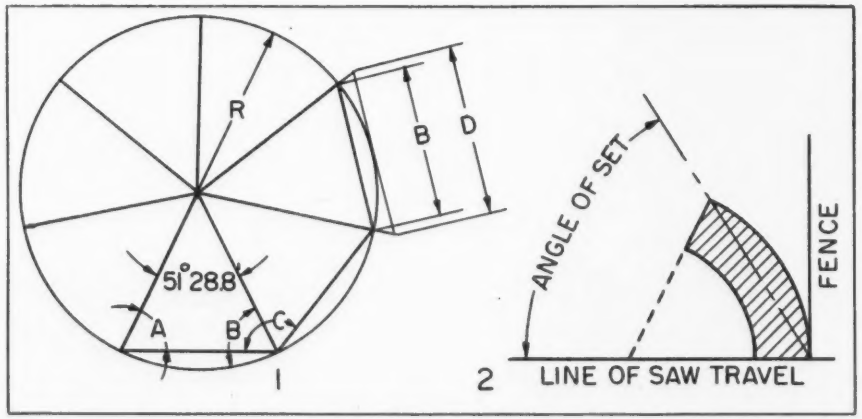

Fig. 1—Heptagon showing the various angles and dimensions used in laying out the pattern. Fig. 2—In sawing the segment for a regular polygon the angle of set must be exact to obtain a good joint

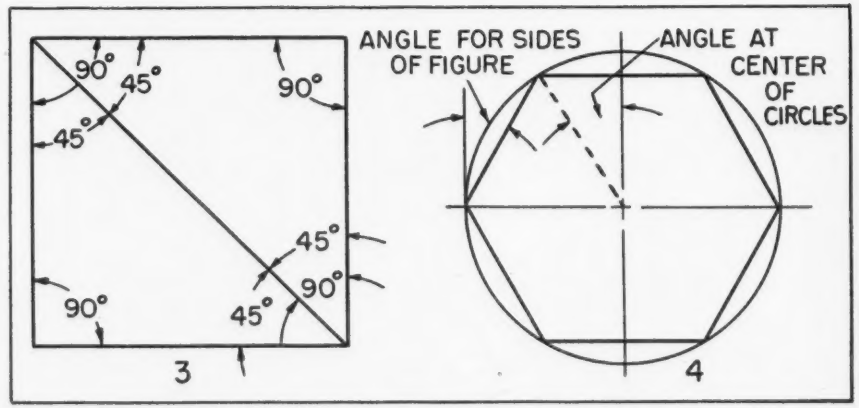

Fig. 3—The sum of the angles of a square equals 360 degrees, and those of a triangle 180 degrees. Fig. 4—Illustrating the various terms indicated in Table II

TABLE 1

Data For Regular Polygons

Name of Polygon	Number of Sides	Angles at Center	Angles Between Adjacent Sides	Side of polygon Inscribed in Circle	Radius of Inscribed Circle	Angle of setting stop
Triangle	3	120°	60°	1.732	0.2887	30°
Square	4	90°	90°	1.4142	0.5	45°
Pentagon	5	72°	108°	1.1756	0.6882	54°
Hexagon	6	60°	120°	1.000	0.866	60°
Heptagon	7	51° 25.8′	128° 34.2′	0.8676	1.0383	64° 17.1′
Octagon	8	45°	135°	0.7653	1.2071	67.5°
Nonagon	9	40°	140°	0.684	1.3737	70°
Decagon	10	36°	144°	0.618	1.5388	72°
Undecagon ..	11	32° 43.8′	147° 17′	0.5634	1.7028	73° 38.5′
Dodecagon ..	12	30°	150°	0.5176	1.866	75°

TABLE II

Table For Dividing Circles or Laying Out Geometrical Figures

No. of Sides	Included Angle	Angles at Center of Circles in any quadrant	Angles for Sides of Figures in any quadrant
3	120°	30°	30°
4	90°	45°	45°
5	72°	18°—54°	36°—72°
6	60°	30°	30°
8	45°	45°	22° 30′
10	36°	54°—18°	18°—54°
12	30°	60°	15°—45°
14	25° 43′	60° 17′—38° 34′—12° 51′	12° 51′—38° 34′—64° 17′
16	22° 30′	67° 30′—45°	11° 15′—33° 45′
18	20°	70°—50°—30°—10°	10°—30°—50°—70°
20	18°	72°—54°	9°—27°—45°
24	15°	75°—60°—45°	7° 30′—22° 30′—37° 30′

SOME APPLICATIONS OF GEOMETRY IN THE PATTERNSHOP

Fig. 3 illustrates the number of degrees in a triangle and square. The sum of the angles of a square equals 4 x 90 or 360°. The triangle shows 90 plus 45 equals 180°. Then in any triangle the sum of the angles is 180° regardless of the shape.

Referring again to Table I column 4: As the sum of the angles of a triangle is 180°, and as one angle is known as 51° 25.8′, then the sum of angles A and B equals 180° minus 51° 25.8′ or 128° 34.2′ which is also the same as angle C.

Tables II and III will be found convenient to patternmakers especially in allowing for draft and in laying out geometrical figures. Table II is illustrated by Fig. 4.

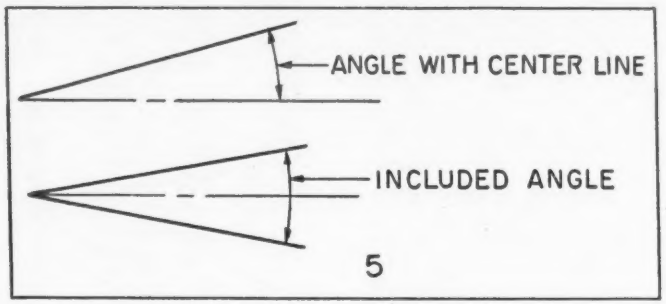

Fig. 5—Taper may refer to the angle with the center line or to the included angle. Tables III and IV give common tapers and corresponding angle

Table III with Fig. 5 is self explanatory. Many of the figures are used in making draft on patterns and often drawings will come to the shop showing tapers of castings wanted. An order may be made out for a certain taper per foot on a side which means the angle with the center line or it may specify total taper or the included angle. If the drawing calls for a certain number of degrees, it is understood to mean the included angle or total taper.

TABLE III

Tapers per foot and Corresponding Angles

Taper per foot Inches	Included Angle	Angle with Center Line	Taper per foot Inches	Included Angle	Angle with Center Line
1/8	0° 36′	0° 18′	1	4° 46′	2° 23′
1/4	1° 12′	0° 36′	1 1/2	7° 09′	3° 35′
3/16	1° 30′	0° 45′	1 3/4	8° 20′	4° 10′
3/8	1° 47′	0° 54′	2	9° 31′	4° 46′
7/16	2° 05′	1° 02′	2 1/2	11° 54′	5° 57′
1/2	2° 23′	1° 12′	3	14° 15′	7° 08′
3/4	3° 35′	1° 47′	3 1/2	16° 36′	8° 18′
1/8	4° 28′	2° 14′	4	18° 55′	9° 28′

TABLE IV

Tapers and Corresponding Angles

	Taper Per Foot in Inches												
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4
	Corresponding Angles for Tapers													
	0	0	0	1°	1°	1°	2°	2°	2°	3°	4°	4°	5°	5°
	17′	35′	53′	11′	29′	47′	5′	23′	59′	34′	10′	46′	21′	57′
	54″	48″	44″	36″	30″	24″	18″	10″	42″	44″	32″	18″	44″	48″
No. of in.	Taper Per Inch in Inches													
1	0.0052	0.0104	0.0156	1/64	1/64	1/32	1/32	3/64	3/64	1/16	5/64	5/64	3/32	7/64
2	0.0104	0.0208	0.0313	3/64	3/64	1/16	5/64	5/64	7/64	1/8	9/64	11/64	3/16	13/64
3	0.0156	0.0312	0.0469	1/16	5/64	3/32	7/64	1/8	5/32	3/16	7/32	1/4	9/32	5/16
4	0.0208	0.0417	0.0625	5/64	7/64	1/8	9/64	11/64	13/64	1/4	17/64	21/64	3/8	27/64
5	0.0260	0.0521	0.0781	7/64	1/8	5/32	3/16	13/64	17/64	5/16	23/64	27/64	19/32	33/64
6	0.0312	0.0625	0.0938	1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2	9/16	5/8
7	0.0365	0.0729	0.1094	9/64	3/16	7/32	1/4	19/64	23/64	7/16	33/64	37/64	21/32	47/64
8	0.0417	0.0833	0.1250	11/64	3/16	1/4	19/64	21/64	27/64	1/2	37/64	43/64	3/4	53/64
9	0.0469	0.0937	0.1406	3/16	15/64	9/32	21/64	3/8	15/32	9/16	21/32	3/4	27/32	15/16
10	0.0521	0.1042	0.1563	13/64	17/64	5/16	23/64	27/64	33/64	5/8	37/64	53/64	15/16	1 3/64
11	0.0573	0.1146	0.1719	15/64	9/32	11/32	13/32	29/64	37/64	11/16	41/64	59/64	1 1/32	1 9/64
12	0.0625	0.1250	0.1875	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4

Why P&H *Job-Engineered* Cranes mean better service for you

When you buy a P&H Overhead Crane, you buy proved performance. Your crane will be *engineered* to meet the requirements of your specific job — coordinated with P&H electrical equipment, designed . . . not adapted . . . for crane service. There will be ample reserve capacity, adequate service life, maximum safety and every modern operating advantage. All these combine to give you long years of crane service with the least trouble and maintenance cost.

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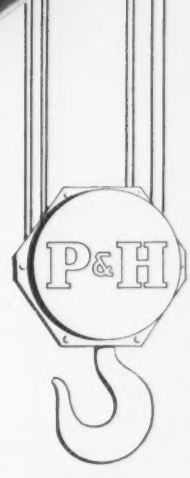
***T.M. of Harnischfeger Corporation for electro-magnetic type brake.**



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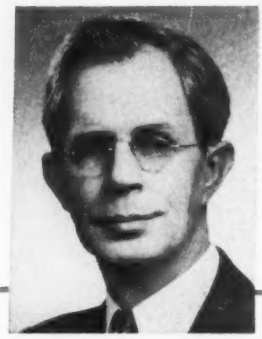
FOUNDRY Data Sheet March, 1951

MAN-TO-MAN

on the Molder's Bench

"Gift Horses"

By RALPH L. LEE



BUSINESS has been rather brisk this past month up in the Lee Hobby Foundry, although I may be using the word "business" rather loosely. In checking over the orders for this period I find that 104.2812 per cent was taken on a no charge basis. I realize, of course, that too much of this sort of thing might easily throw a strain on the financial structure. On the other hand, we all know that good will is important and that our relationship with the public (Public Relations) must be constantly kept in mind. Joking to one side, I was wondering whether nonamateur foundries have experiences similar to ours.

Several weeks ago a good friend of mine—one of my business associates—dropped into the foundry with a little thank-you job he had been threatening me with for some time. I must say that I had encouraged him with his threatening. Seems that this fellow had caught a sail fish (I think it was—with a long sticker on its nose) and considered this episode one of the high points of his life.

Well anyway, he had kept the sticker as proof to his friends that his fish story had some substance, and wanted to make a paper knife out of it. The end of the sticker originally attached to the fish had split open into a number of slivers. Now what he wanted to do was to fill in the space between the slivers with silver and to cap over the open end with the same stuff. What he wanted was sort of a silver, inlaid with sail fish sliver effect. He'd been saving odds and ends of old silver for this job.

The fame of the Lee Hobby Foundry had long since reached him, and after many false tries we had finally gotten together. After outlining what he had in mind he asked me what I thought. When I suggested that he saw off the slivers down to the solid part of the sticker, I could see by his face that I had said the wrong thing, for he had set his heart on seeing the wedges of silver showing in between the slivers of sticker. I didn't even try to defend my suggestion, for I realized that whenever sentiment takes the place of utility, logic is out of place.

It was quite some problem making the pattern for that silver insert, but I finally managed it by making an impression of the cavity just as a dentist goes about making an inlay for a tooth. Estimating how much silver to melt was quite a job and I'll have to admit that his hunch was better than my figures. But we got the casting, with a lot of my sweat and much to his delight; in fact, he acted like a little kid on Christmas morning.

Later I learned through the grapevine that my friend had been spreading news of the Lee Hobby Foundry far and wide. This was borne out by inquiries and a number of no-charge orders, proving that there isn't the slightest doubt that good will can be built over the personal favor route.

But I could also see that a foundry, or any other business for that matter, could go plumb hog-wild on a mistaken notion as to just how effective personal favors are, over the long run, in getting and holding business.

Years ago, as accessory engineer of the old Delco Light Co., I had to O. K. all of the electrical appliances before they could be listed in our sales catalog for Delco Light dealers. This being the case I was courted by a flock of manufacturer's representatives. Before I got very far I broke all precedent by inviting peddlers of interesting items out for lunch and dinner instead of vice-versa. After all, I said, "Who's doing what to who?"

I suppose that somewhere, as a result of loads of cut-and-try experience, there must be a set of percentage figures showing just where the break-even point is on the curve of selling through entertaining, thank-you jobs and personal favors. After years of getting around plenty I am forced to the conclusion that whenever a piece of business can be swung one way or another on the basis of entertaining and personal favors, then there can't be enough difference in the value of the competing products to shake a stick at.

If this is the case (and Heaven forbid) then such business at its best is bound to be fickle, always hanging by a thread and subject to every breeze that blows. And I was just thinking that it might well be that cutting prices below cost might also come under the same heading; in fact, any concessions which can't possibly hold water in face of the books is bound to raise the question of shinanigans in some form.

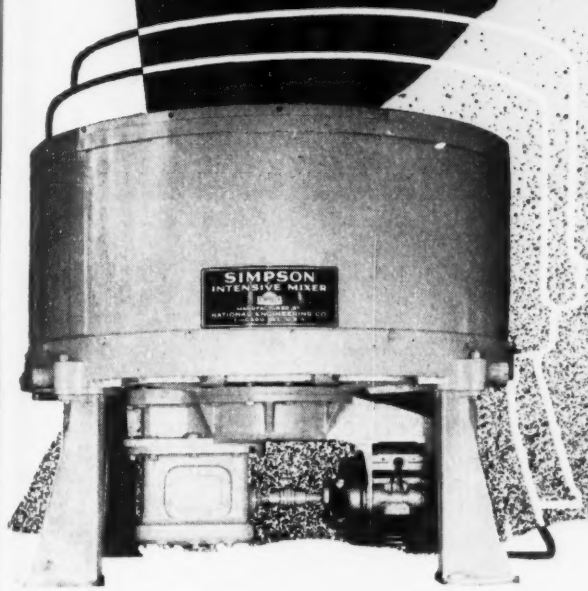
As an amateur foundryman I imagine that I am sticking my neck out but, with some professional standing in the field of sales, sales promotion and public relations, I am sure there truly is a definite line which divides legitimate sales promotion and various forms of unintentional or deliberate bribery. And when you get right down to it that's what this other stuff really is.

It seems to me that every foundry, even the smallest, should set aside a certain amount in relation to sales

(*Concluded on page* 149)

150,000 TONS OF SAND

Prepared in 3 SIMPSONS WITHOUT REPLACING A SINGLE PLOW OR OTHER MIXER PART!



...another case where RUGGED MIXER DESIGN plus PREVENTIVE MAINTENANCE *paid off!*

HERE'S an excellent example of the results you can get by following a simple *preventive maintenance* program: In one year's time, three No. 3 Simpson Mixers, installed in a large eastern malleable foundry turned out 150,000 tons of properly prepared molding sand, without replacing a single plow or other mixer part! Their preventive maintenance program was simple . . . they spent just 30 minutes a day cleaning and greasing each mixer, checking the plow settings, and adjusting them if necessary.

This enviable record is based on the production capacity of 90 tons per hour for all three mixers, each handling 3000 lb. batches. These 3 mixers are all controlled by National Time Masters, requiring only 1 mixer operator.

In addition, this foundry has also operated two No. 2 Simpson Mixers in their Core Room since May 1948 *without replacing a mixer part of any kind!*

This is just one of many similar installations wherein *preventive maintenance* added to the rugged design of Simpson Mixers has resulted in better sand control—more uniform results—top efficiency—and tremendous savings in maintenance costs.

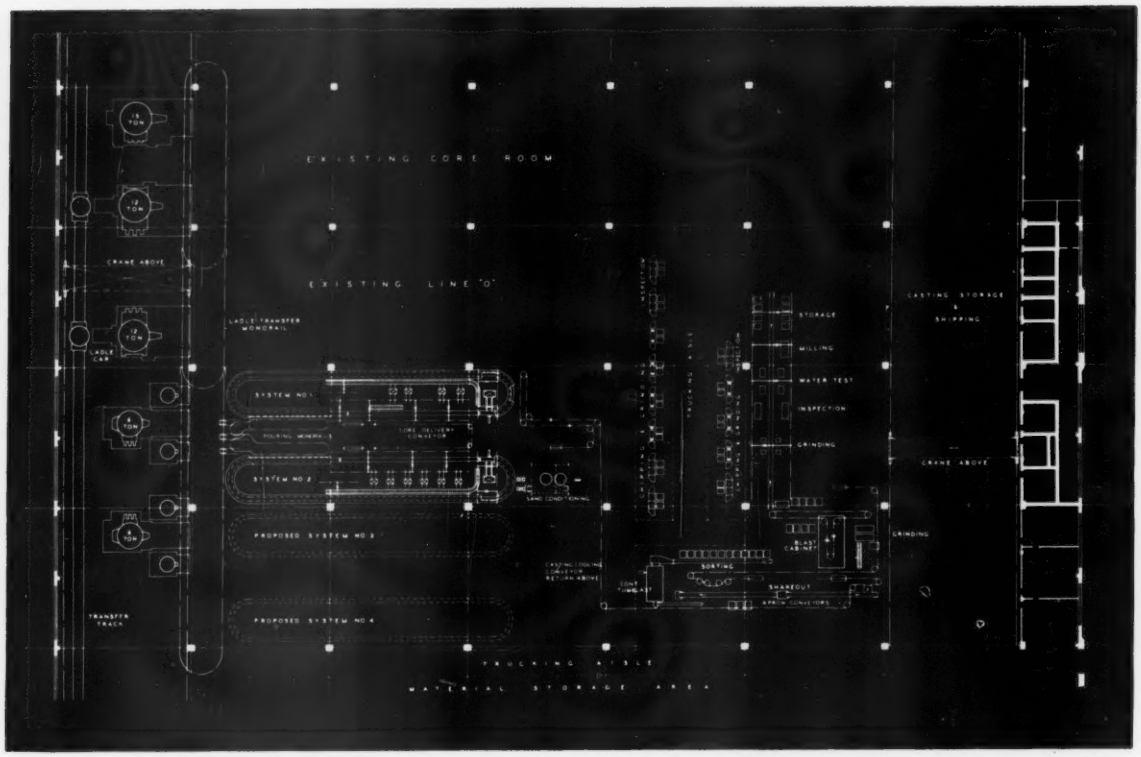
Are you taking advantage of this kind of performance? If not, let us discuss your mixing and sand handling problems with you. Write for further details.

SIMPSON Intensive MIXERS

NATIONAL *Engineering Company*

608 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents: For Continental European Countries—George Fisher, Ltd., Schaffhausen, Switzerland; for British Possessions—August's Limited, Halifax, England; for Canada—Dominion Engineering Co., Ltd., Montreal; for Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney; for Argentina, Brazil and Uruguay—Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; for Mexico—CASCO, S. De R.L., Mexico, D.F.



FIAT, Turin, Italy—Mirafiori Plant

FIAT, one of the leading automobile manufacturers, has retained Giffels & Vallet, Inc. to modernize their foundry facilities to American standards of production using American equipment.

The many features contributing to the layout and design of this foundry were accomplished through the combined efforts of the foundry engineers of Giffels & Vallet, Inc. and the Owner's representatives, whose intention it is to make this the most modern foundry in Europe.

Our foundry engineers are available to assist you. We will gladly, without obligation, discuss your engineering problems and the assistance we could render.

GIFFELS & VALLET, INC.

INDUSTRIAL ENGINEERING DIVISION

1000 MARQUETTE BUILDING, DETROIT

(*Concluded from page* 146)

for getting around among the people who need castings and making friends with them, not by putting them under obligations, but by talking shop—shop talk which invariably leads to our own specific shop and the outstanding work done in our shop. If favors are in order we can keep most of them within the bounds of the shop, by getting the order out a little sooner, a better finish than we promised and legitimate stuff like that.

Well, be this as it may, I'm going to keep right on doing favors for certain friends of mine with fish stickers and such, but I'm not going to kid myself while doing it by expecting too much in return. In fact, I'm not going to confuse these personal indulgences with sound sales promotion, for we all know they are two entirely different breeds of cats.

One thing is certain, I definitely am going to try at least to get a better balance between charge and no-charge orders up there in the Lee Hobby Foundry this next quarter.

MALLEABLE FOUNDERS' SOCIETY

Holds Semiannual Meeting

PROBLEMS of manpower, safety, personnel relations, research, and defense controls featured the program of the semiannual industry meeting of the Malleable Founders' Society, held in Cleveland, Jan. 19. Ralph T. Rycroft, president, Kencroft Malleable Co. Inc., Buffalo, and president of the society, presided.

Lewis D. Barton, industry relations representative, Bureau of Employment Security, Department of Labor, discussed principles and policies essential to handle the present manpower situation and at the same time build a solid foundation to meet any future manpower emergency. These include:

1. Eradicating such hiring practices as hoarding, pirating, indiscriminate advertising and in-migration before local labor supply is exhausted, which operate against utilization of workers where they are needed and at their highest skills.

2. Easing requirements to permit use of women, disabled veterans, other handicapped workers and retired workers.

3. Using local offices of various state employment services wherever possible.

4. Taking complete inventories of existing work forces immediately to indicate which individuals in which occupations are subject to the draft, and to supply information on replacement requirements.

5. Employers determining causes of excessive turnover and absenteeism and devising measures to reduce these factors.

6. Providing immediately an in-plant training and upgrading program.

7. Surveying, evaluating and utilizing local labor supply. Personnel administration is a vitally important function that should be placed only in expert hands.

James H. Lansing, technical and research director of the society, outlined some recent developments in the organization's technical program. He mentioned the research study on nodular iron, the recent publication of a report on malleable foundry nomenclature, the progress made in showing the society film, especially to government representatives in Washington, and recent shop practice meetings devoted to gating and feeding. Mr. Lansing showed a number of examples of good gating and feeding practices discussed at these meetings.

Lowell D. Ryan, managing director of the society, reported on recent developments in Washington with respect to priorities, allocations and other controls. He stated that A. J. McDonald had been made chief of the Iron and Steel Castings unit of the Iron and Steel Division of NPA, and he discussed recent contacts with the ESA. According to Mr. Ryan, a sampling of the industry indicated the percentage of DO orders in malleable foundries ranges from 0 to 30. However, there has been a marked increase recently in DO orders received and indications are that malleable companies will have a substantial percentage of such business shortly. Meanwhile, there has been no noticeable decrease in volume of civilian business and some companies report an increase in that type of orders.

Whiting Williams, Cleveland labor consultant, gave a thought-provoking talk entitled "Building a Winning Company and National Team." In introducing his subject, he stated he was delighted at the improvement that has taken place in foundries the last 30 years.

Mr. Williams stressed the point that the worker is helping his employer most when he takes pride in his job, his skill, his company and his industry. All humans want to believe themselves personally important, and are equally anxious to be paid attention as worthwhile individuals. The matter of pride is of great importance, and, if we cannot take pride in our work, we have a hard time taking pride in ourselves. In modern warfare, the will to work has become far more important than the will to fight.

John E. Allen, general superintendent, Central Furnaces, Docks & Coke Works, American Steel & Wire Co., Cleveland, spoke of the importance of safety, especially in light of today's critical manpower condition. He indicated that a modern safety program should promote the commonsense approach to safety, should devise methods and equipment so that the shortest way of working is the safest, and should be perpetual in duration. The experience of his company has shown that the most successful programs are those having contests among like groups of the same type of workers.

Mr. Allen referred to the new safety competition to be sponsored by the society. This is a "self improvement" type of contest wherein each company will try to improve its own accident frequency record. Awards will be made in four classes, to the company in each class showing the greatest percentage reduction in its own frequency rate in 1951 compared with 1950. Suitable certificates will be presented to the winning companies.

Predicts Soaring Business

Dr. Ralph W. Robey, vice president and chief economist, National Association of Manufacturers, discussed the economic outlook for 1951. He predicted soaring business for the immediate future. While there will be some readjustment, volume will be high. Although controls might hold prices steady, present policies indicate continued inflation.

Mr. Robey stated that while at present the defense effort is taking only 18 per cent of the manufactured products of the country, Washington is using that 18 per cent to take control of the other 82 per cent. Washington talks of pay-as-you-go to the tune of $16 billions. Business and the middle and upper income brackets must pay for it with money which should be used for expansion and increased production. Instead, this will be poured into the lower income levels, and thus will cause more inflation. Mr. Robey believes that unless we are careful, we are going to be given an economy entirely contrary to that which has made us great.

On display at the meeting was a

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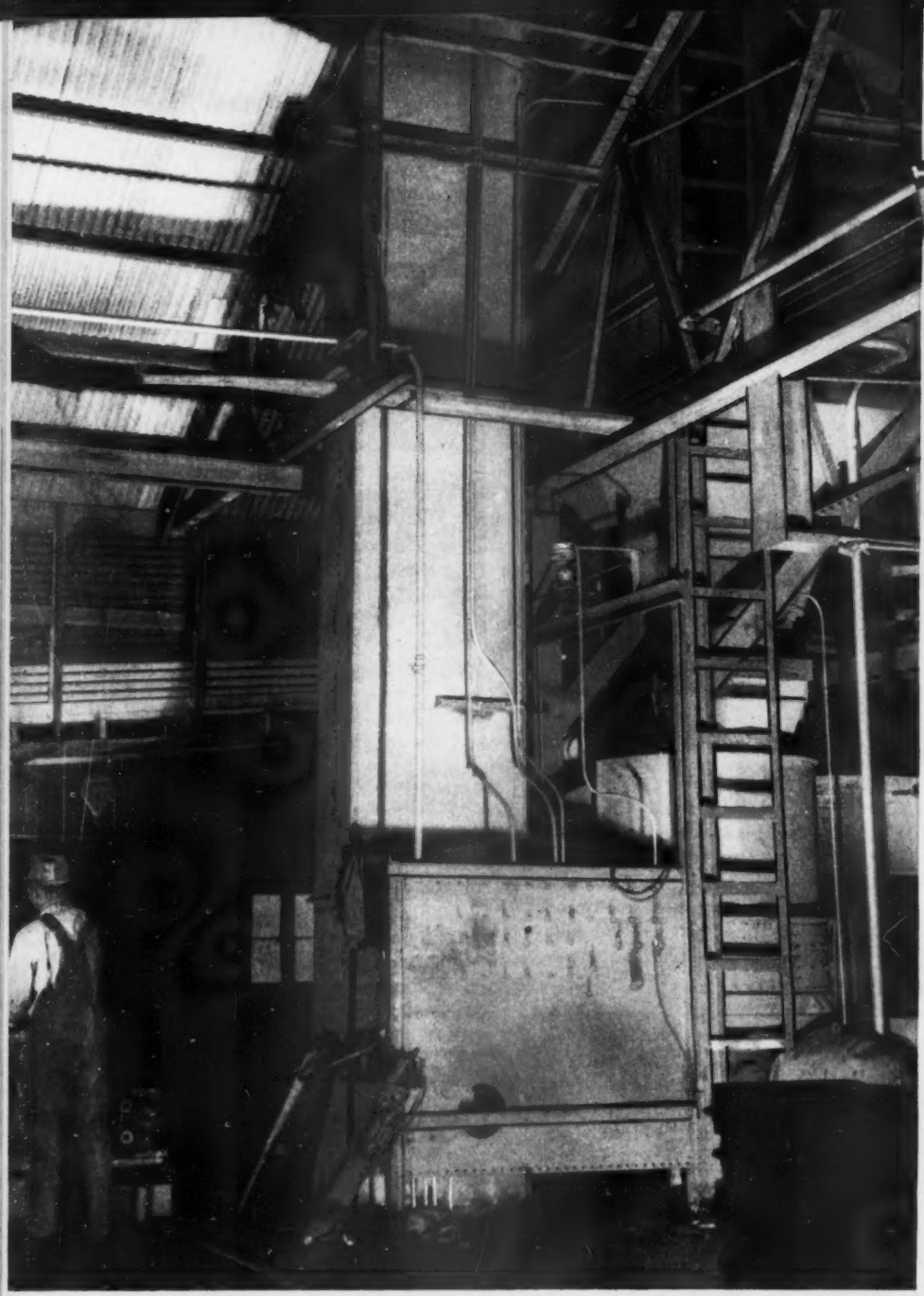
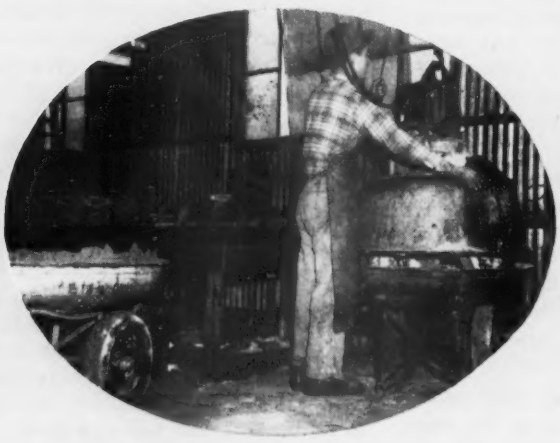


Empire's new mulling and conditioning unit. The bucket elevator discharges sand onto a B&P Gyratory Screen through which it passes into an 18-ton storage tank located over the Speed-mullor. Then the sand is thoroughly mulled in a 90 second cycle.



All of Empire's core sand is mulled in a Mulbaro. Each batch now requires less than ⅓ of the time formerly needed with a paddle mixer and core oil consumption has been reduced 25%.

Mold is lowered onto shakeout—sand falls through shakeout grate onto belt with magnetic head pulley.

NOVEMBER
1950

A SMALL FOUNDRY HITS MOST PROFITABLE MONTH WITH A SPEEDMULLOR

More Molds Per Day! Material Costs Reduced Two-Thirds! Man-Hours Down 20%!

mpire Pattern and Foundry Company, Tulsa, klahoma, installed a Model 50 Speedmullor late in ctober of 1950. The next month, the *first* full onth of Speedmullor operation—was the most rofitable in the 17 years of operation of this foun-ry. They increased production on their cope and rag units by 100 molds in 5½ hours using four ewer men than were formerly required. On Em-pire's snap flask floors, production increased 70 molds in 5½ hours. $200.00 was saved on new sand alone in one month, and bonding additions were reduced by two-thirds.

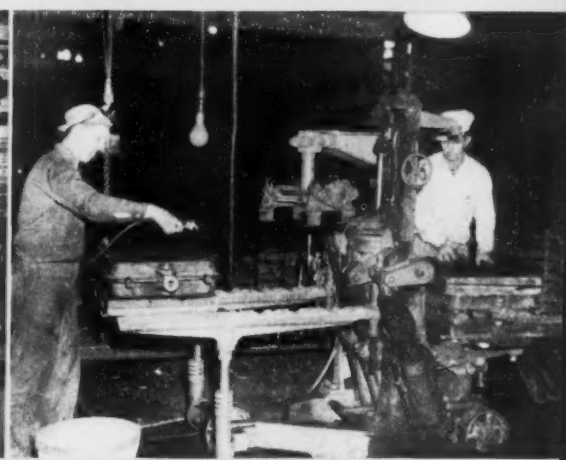
February BETTER METHODS features Empire's complete story. Send for it today and while writing, ask for information on how your foundry, *too*, can realize more profitable operation. Speedmullors are industry-accepted as *today's answer* to all mulling problems.

BEARDSLEY & PIPER
Division of PETTIBONE MULLIKEN CORPORATION
2424 North Cicero Avenue, Chicago 39, Ill.

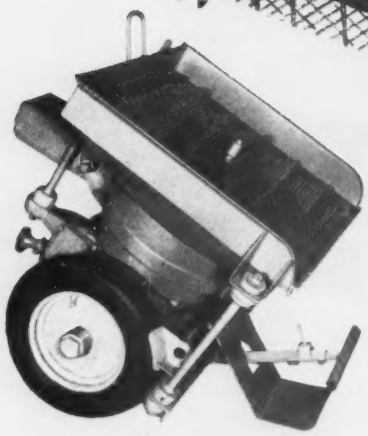
Manufacturers of the Sandslinger • Speedslinger • Hydra-Slinger • Speedmullor • Mulbaro • Screenarator • Nite-Gang • Junior Nite-Gang • Preparator • B&P Combination Sand Conditioning and Mulling Unit • B&P Champion Speed-Draw • B&P Plate Feeder • B&P Turntable • B&P Gyratory Screen

0 pound batches are measured into the Speedmullor m the overhead tank by an air-operated batch hopper.

Mulled sand is discharged onto floor after a 90 second total mulling cycle, and a front end loader delivers it to molders.



Drags are rammed on a Johnston & Jennings jolt rollover. Mold conveyors are seen in the background.



to foundries who need **FLEXIBILITY** in sand preparation

Got that hard-to-solve sand problem? Need prepared backing sand and special facing sand intermittently in several locations? The Screenarator is the answer . . . it's *portable* . . . it prepares as high as *45 tons per hour* . . . it produces *thoroughly* screened, *twice* aerated, lump-free, flowable sand . . . at *lowest* original and maintenance cost.

Thousands of foundries use the Screenarator! It's *today's answer* to increasing demands for more castings and greater quantities of prepared sand. Write today for Screenarator descriptive folder!

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B&P

Manufacturers of the Sandslinger • Speedslinger • Hydra-Slinger • Speedmuller • Mulbaro • Screenarator • Nite-Gang • Junior Nite-Gang • Preparator • B&P Combination Sand Conditioning and Mulling Unit • B&P Champion Speed-Draw • B&P Plate Feeder • B&P Turntable • B&P Gyratory Screen

(*Concluded from page* 149)

bulletin board illustrating many of the society's varied activities. Entitled "MFS Program and Activities 1950-51," the board featured information on the forthcoming safety contest, sample bulletins pertaining to developments in Washington, samples of technical bulletins and surveys, copies of statistical reports together with samples of promotion material.

OBITUARY

HARRY Hanson, 65, vice president-secretary, Griffin Wheel Co., Chicago, died there Jan. 12. Associated with the company 48 years, Mr. Hanson became secretary in 1938 and vice president in 1947. He spent his entire business career in the car wheel industry.

* * *

Louis C. Hetzel, 62, formerly associated with Alliance Steel Casting Co., Alliance, O., and for 9 years until 1935 foundry superintendent-works manager, Sharon plant of the Pittsburgh Steel Foundry Co., died Jan. 7. He retired from Alliance Steel in 1937.

* * *

James A. Williamson, 75, for over 20 years treasurer, New Jersey Foundrymen's Association, died Jan. 5, in Newark, N. J., where he made his home. Mr. Williamson was superintendent-treasurer, Isbell-Porter Co., Jersey City, N. J., until he retired in 1940. During World War II he became purchasing agent, Barnett Foundry & Machine Co., Irvington, N. J.

* * *

Charles C. Rohrbach, who in 1938 succeeded his father as secretary-treasurer, the Crucible Manufacturers' Association, died Dec. 22, in New York. Mr. Rohrbach, who attended Stevens Institute of Technology, was active in trade associations since 1933. He was a member of the Railroad-Machinery Club and the Trade Association Executives, New York, as well as the American Trade Association Executives, Washington.

* * *

John Avery, president, Roots-Connersville Blower Corp., Connersville, Ind., died Jan. 13. A native of Boston, Mr. Avery was graduated from U. S. Naval Academy in 1923. First associated with General Electric Co.'s engineering staff, in 1926 he became a project engineer, Brown-Boveri Co., Switzerland. From 1932, until 1946, when he joined Roots-Connersville, he was with Allis-Chalmers, Mil-

waukee. Mr. Avery was a member of the executive board of the Machinery & Allied Products Institute, Chicago, and a director of the Compressed Air & Cas Institute, New York.

* * *

John Stanton, treasurer, Stanton Foundry Inc., Syracuse, N. Y., died Feb. 3, at his home there. A native of England, Mr. Stanton had resided in Syracuse for 35 years.

* * *

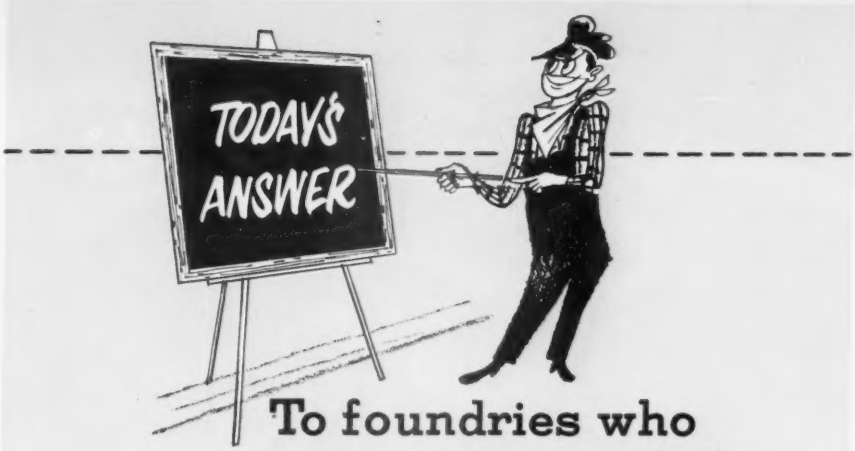
Jule M. Keller, 79, until his retirement in 1944 foundry manager and in charge of sales, American Car & Foundry Co., St. Louis, died at his home there Jan. 24. In 1894 Mr. Keller became secretary to the vice president-general manager, Missouri Car & Foundry Co., predecessor of American Car & Foundry Co. When the latter was organized he was made superintendent of the wheel and casting foundry for the St. Louis and Madison plants.

* * *

Walter Geist, 56, president, Allis-Chalmers Mfg. Co., Milwaukee, died suddenly Jan. 29. Mr. Geist, a native of Milwaukee, left high school in 1909 to join the company, and later enrolled in evening and extension courses at University of Wisconsin. After serving as a messenger boy in the blueprint department, he entered the milling department where he became draftsman, engineer and assistant manager in 1928. While an engineer in charge of transmission in the milling department he developed the multiple V-belt drive and moved into the sales organization. In 1933 he became general sales representative for the general machinery division, and in 1939 was elected a vice president in the general machinery division. He was made president in 1942.

* * *

Col. Earl D. Payne, 47, industrial liaison officer, Munitions Board, Washington, died Feb. 8, at Fort Belvoir Hospital, Va. A native of Perry, O., Col. Payne was graduated from Cincinnati University. Following several years as an electrical engineer he was commissioned a reserve officer in 1940 and two years later was sent to Washington, assigned to the statistical branch, Office of the Chief of Ordnance. From 1946 he was stationed in Japan and in 1948 returned, spending a year as a student at the Industrial College, Fort Lesley J. McNair. In 1950 he was assigned to the Munitions Board and last May succeeded Col. Frank H. Holmes as liaison officer to various advisory committees, including the Foundry Industry Advisory Committee and its eleven subcommittees.



To foundries who must prepare quality sand on the floor

Need greater floor sand cutting capacity and better sand to meet today's demands? Here's *your* answer . . . the Nite-Gang! With it you can get up to 50 tons per hour of fluffy, scrap-free, shot-free, lump-free, thoroughly mixed sand; uniform from top to bottom of the windrow or heap. And important, too, you'll obtain greater production per molder at lower cost!

The Nite-Gang self-propels, self-loads, blends, magnetically separates, breaks lumps, thoroughly screens, double aerates and windrows or piles.

Write today for Nite-Gang descriptive folder!

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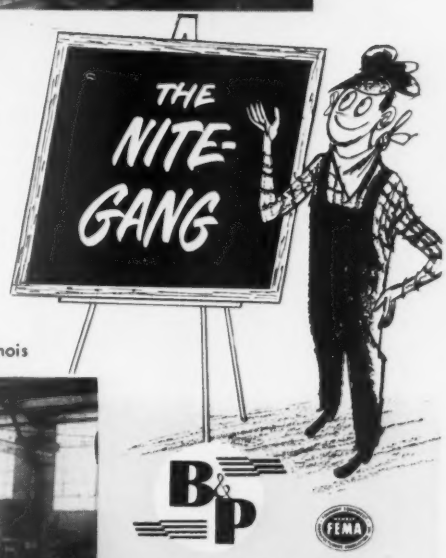

B&P FEMA

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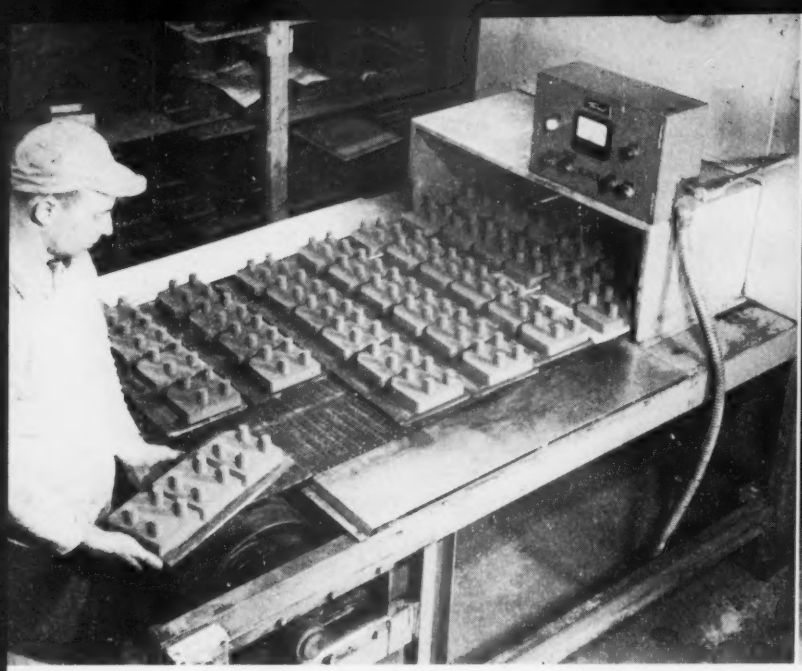
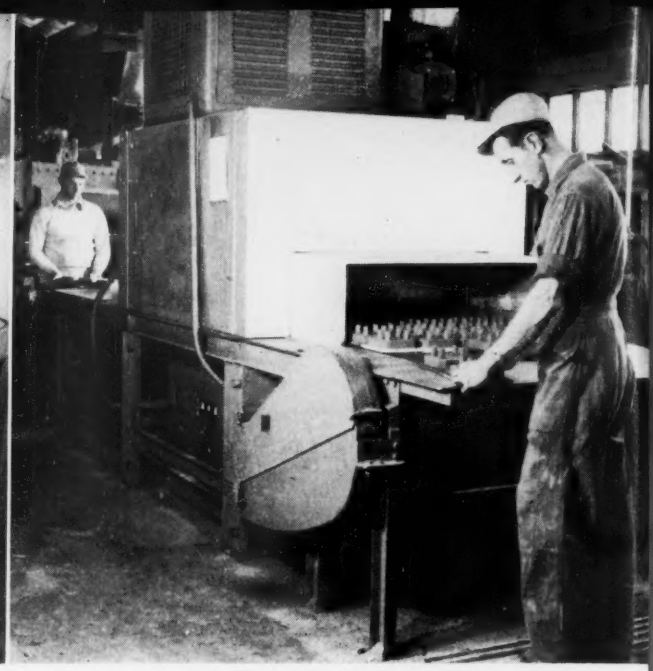


Close-up view of loaded core plates as they move by belt conveyor into high-frequency baking unit



Inspector taking away baked cores as they emerge from the tunnel. Cores are cool enough to handle

ELECTRONIC CORE BAKING

By BOYD HOPKINS
Thermex Division
Girdler Corp., Louisville

THIS is a brief account of how United Foundries Co., Wyoming, Pa., has employed high frequency sand core baking equipment to: 1. Keep the quality of its products uniformly high; 2. Raise coreroom yield to 99 per cent; 3. Cut rejected castings to 1-5 per cent; 4. Save more than 50 per cent on labor, and provide better working conditions; 5. Avoid a costly and time-consuming construction program; 6. Obtain a favorable competitive position.

The case history of this tooling-up operation goes back to Jan. 1, 1950, when the company was faced with a production problem. Sales volume was growing briskly, a long-run production job had come in, and greater core baking capacity was urgently needed to meet molding schedules. A complicating factor was that every square foot of floor space was in use.

A review of current and projected schedules had indicated that a high-frequency core sand baking unit would meet output requirements. Moreover, its dimensions of only 17 ft 9 in. x 5 ft 2 in. obviated the need for plant construction to provide more floor area. The unit was delivered on Jan. 23. An engineer arrived the next day to supervise installation of the equipment, and on Jan. 25 electronically-baked cores were being sent to the molding floor. By Jan. 27, the equipment had been completely integrated with the plant's other facilities, which included a newly acquired core blower.

Synthetic resin binders are used in electronic baking, and a few standard mixes take care of virtually all core requirements. Collapsibility characteristics can be controlled accurately, and thus facilitate the shakeout. Mulling time for a typical mix is seven minutes. From the blower the cores are loaded directly on the adjacent conveyor, at the input end of

(*Please turn to page* 212)

Electronically baked cores at United Foundries Co. range in weight from 4 ounces to 19 pounds

UNITED STATES ELECTRICAL TOOLS

PROVED QUALITY
PROVED ECONOMY
PROVED PERFORMANCE

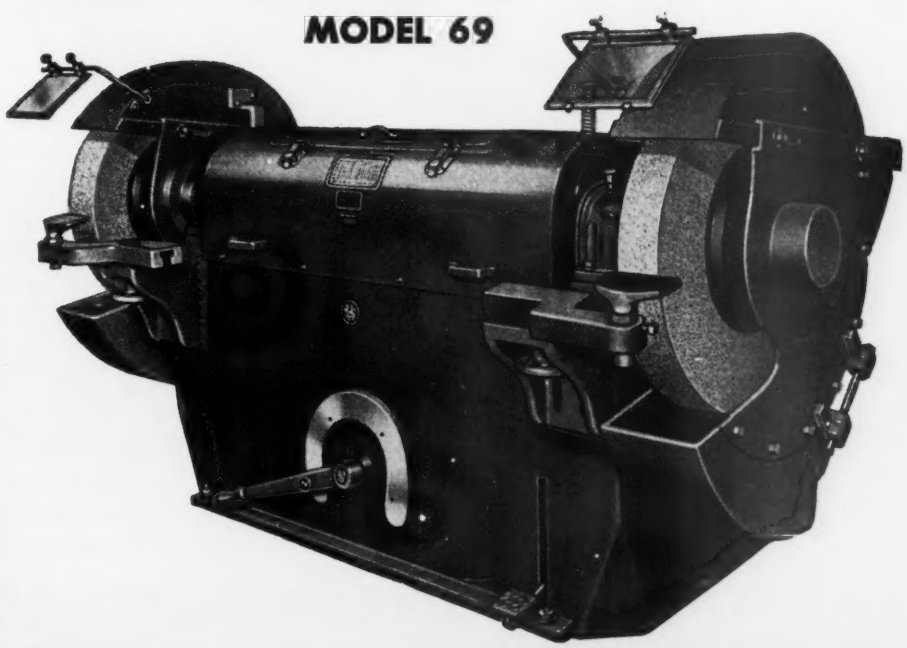
ADJUSTABLE SPEED SNAGGING GRINDER

For heaviest type production grinding where more power is required than on the average production job. Equipped with semi-enclosed, constantly lubricated four-speed drive transmission enabling operator to maintain efficient peripheral speed for the full life of the wheel. The speed lever is interlocked with guards which makes it impossible to increase speed unless wheels are worn down sufficiently to justify speed change. Electric interlock prevents operation of machine unless gears are in mesh.

FOUR SPEED CHANGES

FOR VITRIFIED OR HIGH SPEED WHEELS. WHEEL GUARDS ADJUSTABLE TO WHEEL WEAR

MODEL 69



THE ENTIRE U. S. LINE is precision-designed and precision-engineered and built to turn out satisfactory jobs on production or maintenance . . . and to give you

more work . . . per man . . . per hour per job and no "per-haps"

CONTACT YOUR JOBBER for

drills
grinders
surfacers
polishers
sanders
tappers
hole saws
buffers
flexible shaft machines and other tools

The UNITED STATES ELECTRICAL TOOL *Co.*
CINCINNATI, OHIO

The "Swing" is Toward SAFETY!
Today's vital need, conservation of men and materials, calls for increased safety and efficiency. BAY STATE abrasive products for all rough-grinding operations are "built" to meet such demands.
Snagging Wheels . . . Cut-off Wheels . . . Raised Hub Disc-Wheels . . . Cones . . . Mounted Points . . . Core Files . . . All BAY STATE products for FOUNDRY use are rugged . . . fast-cutting . . . extra safe.
Ask for BAY STATE'S "on the spot" engineering help on your next abrasive problem.
BAY STATE
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BAY STATE
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Feeders for Castings

ABC of Foundry Practice

By PAT DWYER, *Engineering Editor, FOUNDRY*

CASTINGS of uniform metal section that are unhindered in movement, shrink or contract normally and do not need feeders. Outstanding in this class of castings is the ingot mold used in steel mills. It is large and heavy and cast in a vertical position. Owing to its uniform metal section it passes from the molten to the solid state without any evidence of shrinkage. Of course, normal contraction and shrinkage are shown in the difference in size between the casting and the pattern from which it was made.

This casting also supplies a useful object lesson in the important part played by gravity in the shrinkage and contraction of castings. Where the ingot mold casting is poured in an upright position, gravity and shrinkage work together to produce a solid casting. Attempts to pour ingot mold castings in a horizontal position invariably have failed. A porous area or an actual shrinkage cavity develops in the inside corner at the highest point. While the metal undoubtedly shrinks in a fairly uniform manner, the gravity factor diverts a little more than the normal share to the lower walls, and thereby decreases the density of the metal on top. In one prominent plant in this country ingot mold castings are molded horizontally, but they are upended before they are poured.

Sand May Yield

In this connection it is pertinent to point to an error of judgment frequently made in diagnosing shrinkage cavities in castings with high vertical walls, particularly those cast in green sand molds. Dry sand and loam walls, except when exposed to extra stress, usually are sufficiently rigid to resist the lateral pressure of the molten metal. Green sand is not such a stable medium and sometimes yields. If the sand yields gradually while the metal is rising, the only evidence is a swelled casting. If the wall holds until the mold is filled, and then yields ⅛-in. or more, the result will be a swelled casting with a shrinkage cavity along the top or further down, depending on the degree to which solidification has progressed when the wall yielded. The tendency is to place the blame on the metal or on the absence of a feeder, when in reality the mold is to blame. Instead of prescribing a feeder to supply the shrunken area, the logical remedy is to brace the mold or ram the sand harder.

Successful feeding of a casting, where feeding is necessary, depends on two main factors: 1—An ample supply of metal in the feeding chamber and 2—an open passage for this metal to enter the casting. To fulfill the function for which it is designed a feeder may fall into one of two classifications: It may be large enough in cross section to remain liquid until after the casting has set, or, although smaller in cross section, it may be kept open with a rod and frequent additions of hot metal until the casting freezes to the top.

Feeding a casting through a comparatively small riser, kept open with a rod and addition of hot metal, is fairly satisfactory in many instances. The main objection is the tendency of the solidifying metal to close in concentric rings at the junction point between the feeder and the casting. In some instances the openings close gradually and the resulting metal is solid. In other instances the lines between the rings are apparent and constitute so many cold shut junctions. The metal in this area is neither solid nor homogenous.

Molten metal is drawn from one part of a casting to another during solidification, but—and this is a feature frequently overlooked—most certainly it is not drawn up hill. The various parts of the casting, gates, runners and feeders must be arranged in a manner to harmonize with the law of gravity. Theoretically, a casting shrinks or contracts equally at all points from the perimeter to the center. However, while the shrinkage is in the direction of the center of the casting, it also is in the direction of the center of the earth. Actual examination of any casting while still in the mold will show that while it has shrunk away from the cope and from the sides and ends, it still rests solidly on the bottom.

In many instances a high pouring head is the only cure required for castings that persistently show shrinkage defects. Some castings need a riser in addition to the high head, but in a surprisingly large number of instances a high pouring head will insure a solid homogenous casting without any additional manipulation. This is particularly noticeable in small and medium size castings where the action is rapid, where the metal passes from the liquid to the solid state in a period measured by seconds, and where the static pressure resulting from the high pouring head is exerted in full force during this brief period.

In many cases shrinkage is due to a short-sighted policy which forces a molder to place a sprue and gate in an unfavorable position. On account of the size of the flask or the position of the bars he cannot place the gate stick to the best advantage.

Shrinkage manifests itself in various forms and places and up to the present no one has discovered a positively simple and easily applied remedy. Shrinkage may be caused by many factors, including composition of the metal, position and number of gates, temperature of the metal, condition of the sand, and design of the casting. A change in one or more of these factors usually will prevent a repetition of a particular shrinkage manifestation.

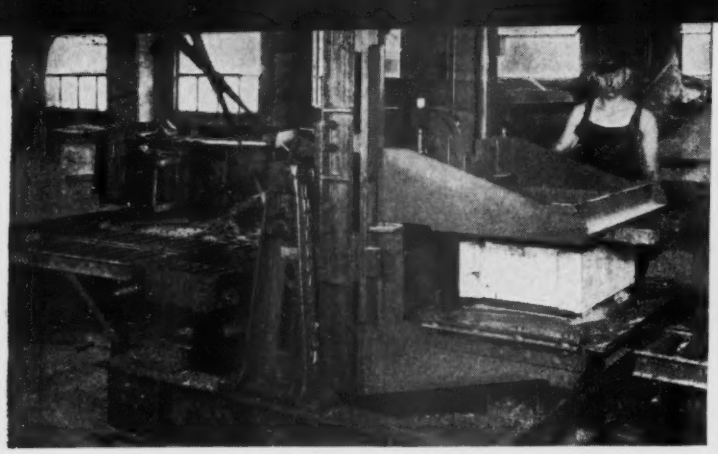
Suggest Several Methods

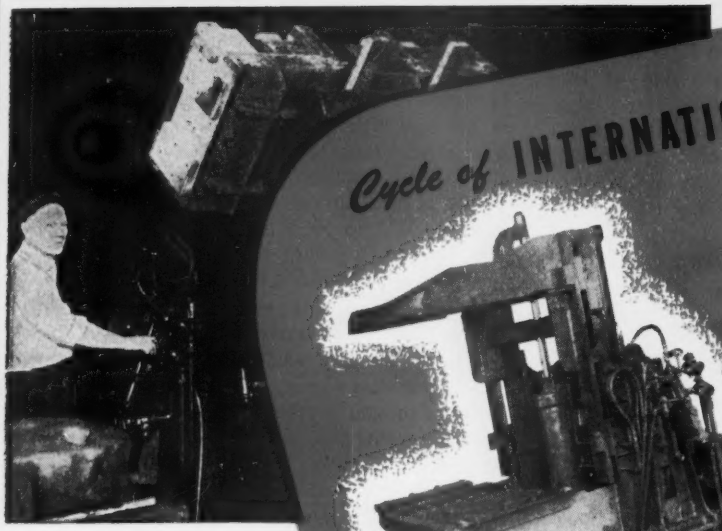
Shrinkage defects invariably manifest themselves at the junction of light and heavy sections, due, of course, to the fact the metal in the heavy section remains liquid for some time after the metal has solidified in the light section. By cooling the metal, by gating the casting at the thin part, by providing gates larger than usual to guard against possible misruns, it is possible that the cooling rate in the thin and thick sections will be equalized considerably. In some instances a reversal of the position of the pattern in the mold will banish some forms of shrinkage.

Several procedures, described briefly below, have been developed in recent years to increase the efficiency of risers. These include application of atmospheric pressure, use of insulating sleeves or pads or both, and employment of insulating or exothermic materials for covers.

Metal from the riser is forced into the casting by a combination of gravity and atmospheric pressure. Atmospheric pressure is shut off when the riser top and walls solidify, and even though the interior of the riser may be liquid, metal cannot flow out since a vacuum is formed. A small dry

(*Concluded on page* 160)





Cycle of INTERNATIONAL TYPE AN MACHINE

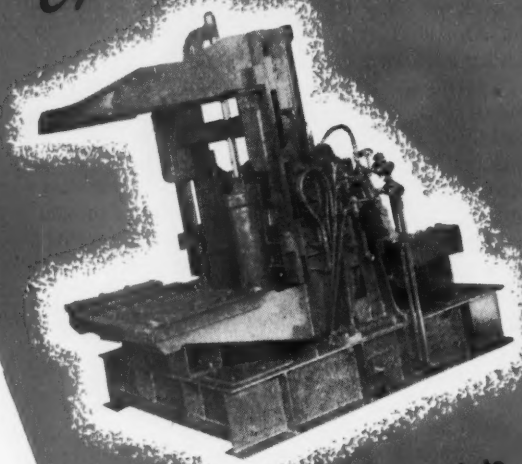


FIGURE 1 shows the machine ready to receive the core box or mold after it has been rammed.

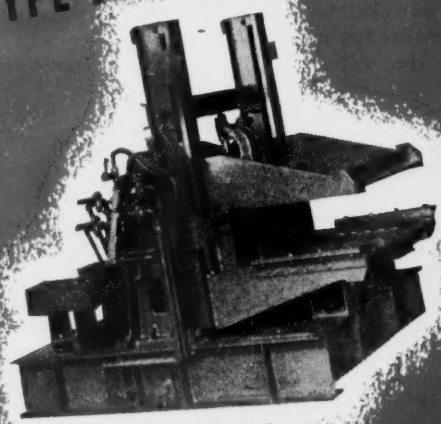


FIGURE 2 shows that the clamp valve has been operated to bring the upper frame down to clamp the core plate to the box or bottom board to flask. The movement of this frame is automatically limited according to the depth of the box or overall of pattern plate flask and bottom board.

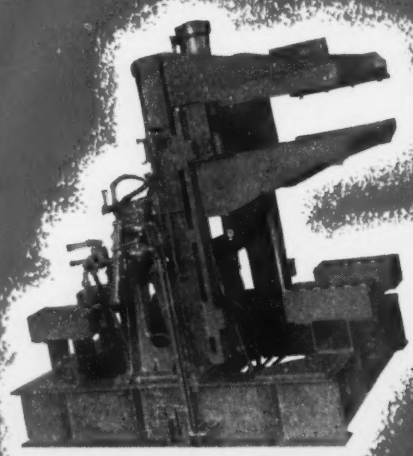


FIGURE 3 shows that the turnover valves of the machine have been operated so that the entire center unit which supports the turnover frame of the machine—carrying the clamped box or complete half mold—is turned over.

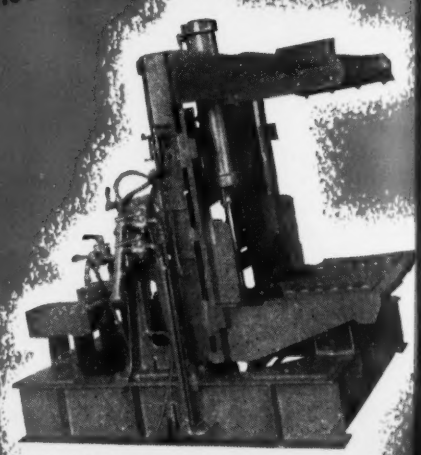
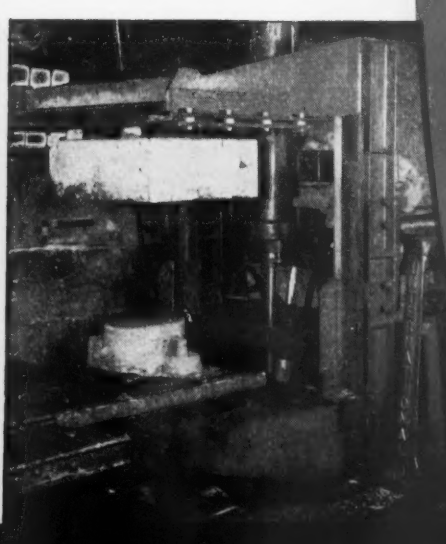
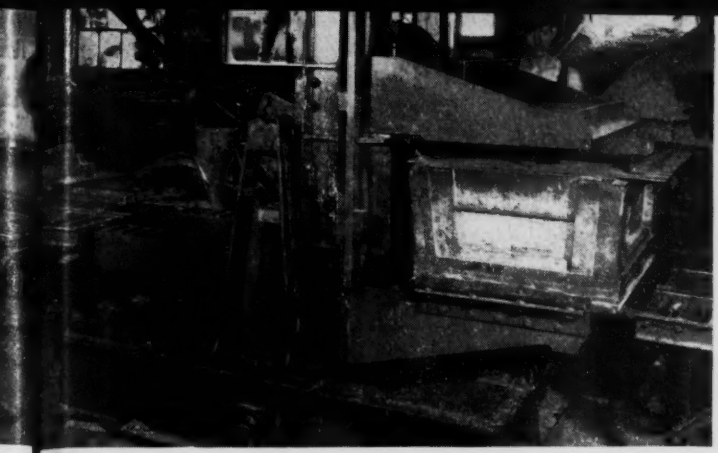
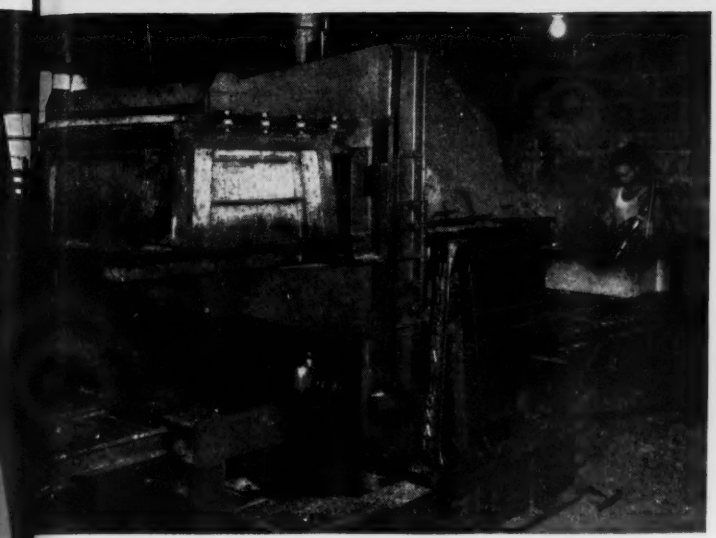
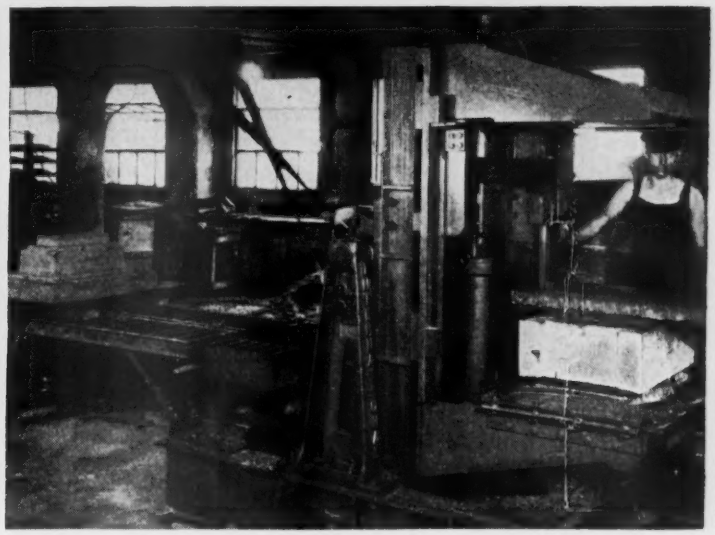


FIGURE 4 shows that the clamp cyli... der has been exhausted, releasing t... core plate—supporting the core— ... bottom board supporting the co... from the turnover frame, thus affo... ing the draw of the machine. ... vibrator operates while the draw ... tion is taking place.





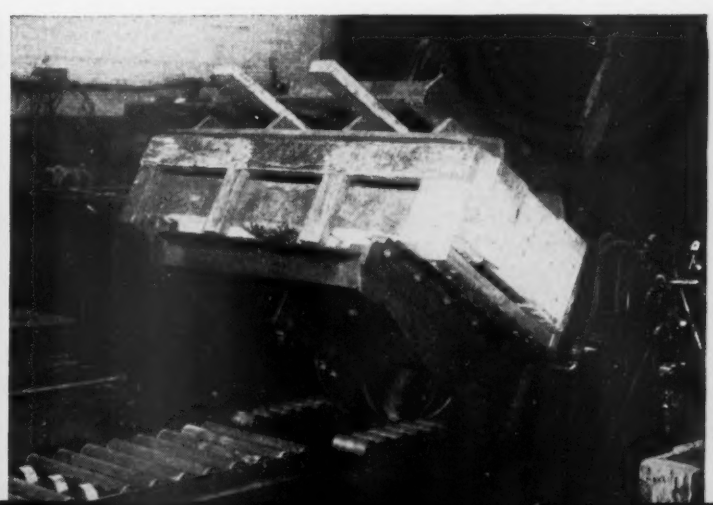




Hard to Draw . . . Short Run . . . Many Different Sizes of Jobs

International Type AN Machine for clamping and turning over core boxes or flasks and for drawing the core or mold. No rigging time is required for this machine. The core box or pattern is fastened to the turnover frame by sliding the cleats that have been fastened to the under side of the box or pattern plate into the grooves with which the turnover frame has been provided. Absolutely no adjustments are required. When boxes or patterns are changed from one size to another, the variations are automatically taken care of, irrespective of how much difference there is in the width, length and depth of the boxes or flasks for which the machine has been recommended.

INTERNATIONAL MOLDING MACHINE COMPANY - La Grange Park, Illinois



(*Concluded from page* 157)

sand core, a carbon or graphite rod, or a piece of wood extending from the outside into the center of the riser maintains atmospheric pressure until the entire riser solidifies. This device has been adopted extensively in steel foundries, but up to the present has not proved so satisfactory in iron or in nonferrous foundries.

Insulation sleeves and pads increase the efficiency of risers to a remarkable degree in ferrous and nonferrous foundries. Sleeves enclose the risers and sprues and the pads are placed against thin sections. Insulation in those areas retards heat extraction and tends to equalize cooling rate throughout the casting. Gypsum cement is employed in nonferrous work where temperatures do not exceed 2300° F. In iron and steel castings a more refractory material has to be employed, and diatomaceous earth (a siliceous material) bonded with bentonite or other agent is used.

Freezing over of tops of open risers many be retarded by application of some form of insulating material. Rice hulls or wood shavings may be used for this purpose. In some cases the material contains metallic compounds which create additional heat, thereby increasing liquidity of the metal in the riser, and then it is called an exothermic riser compound. Sand is not recommended as a cover because it extracts heat from the riser.

Where large risers are necessary, expense and time involved in their removal from the casting are reduced to a material extent by employment of what is termed a "neckdown" or "cut-off" core. It may be a perforated thin core of sand, refractory or graphite, or a metal screen at the junction of riser neck and casting. Cores of sand or refractory are used with ferrous castings and graphite cores and metal screens with nonferrous castings. Core or screen is raised quickly to the same temperature as the metal, which feeds readily through the openings, and the high temperature is maintained until the casting freezes. The device may be applied to a top or side riser, and in many cases the riser, due to the small connection at the casting, may be knocked off with a hammer.

Foundry Sands—Composition, Particle Size

MOLDING sands have certain properties which determine their suitability for various kinds of molds and castings. The working properties of the sand are determined to a large extent by the chemical composition and in a large measure by the size, shape and arrangement of the grain and clay particles.

Chemical analysis shows the following substances in molding sands: Silica, alumina, iron oxide, lime, magnesia, alkalies (sodium and potassium oxides), combined water, organic materials, and possibly a few other substances in small quantities. Usually these materials are not actually found as such; they are generally found in more or less complex combinations, such as the minerals, quartz, feldspar, mica, etc. Combined water is the water which is in such close chemical union with the other materials that it is not evaporated off at 212° F. Combined water and organic material are usually measured together, when analyzing a sand, by drying it at 212° F., weighing out a portion accurately, heating it to a bright red heat and then weighing again. The percentage loss in weight is called *loss on ignition.*

Sands containing lime in the form of carbonates give off gas when muriatic (hydrochloric) acid is poured on them. Physical properties depend so much on the actual mineral combinations that a chemical analysis must be interpreted with great care.

High-silica sands are usually resistant to heat. While pure alumina is even more refractory, many of the mineral combinations in which it is found are much less refractory than silica. Iron compounds are usually red or brown, especially after heating; they are not highly refractory but are usually more plastic and also promote peeling qualities of the sand. Lime and the other alkalies are powerful fluxes and reduce refractoriness. Magnesia is a flux but is less effective than lime.

Combined water and organic material promote bond strength. High loss on ignition may indicate low durability; that is, bond of short life. On the other hand, finely divided organic matter improves casting surfaces; it tends to provide a reducing atmosphere and improves peeling qualities. For this reason, flour is sometimes dusted on mold surfaces in the case of brass castings or finely powdered coal (seacoal) is mixed with heap sand for gray iron.

Particles of sand range in size from about an eighth to a hundred thousandths of an inch or less in diameter. Water in proper quantity, not too much or too little, causes particles to stick together, and the smaller the particles, the better do they stick. The term *clay* is applied to those particles which are less than about 0.0008-in. in diameter. Even in clay the particles differ widely in size. The smaller they are the more sticky they are, the smallest particles clinging to each other and to larger particles like glue. Such tiny particles are called colloids or colloidal material. Such material is absorptive; it takes up great quantities of water, oil or dyes. When dried it becomes hard and strong like portland cement. Bentonite is a highly colloidal clay widely used as a bond.

The word *texture* is also used in speaking of particle size. Sands of fine texture are necessary in order to make smooth casting surfaces.

Foundry sands are classified by grain fineness number, grain distribution and grain shape class. In determining these characteristics the sand must be free from clay material; this is accomplished by washing with water. Procedure is to agitate a weighed sample of dry sand in a quart fruit jar half full of water containing a little caustic soda, filling the jar with water, allowing it to settle for 5 minutes, and then siphoning off the water and clay which failed to settle. This is repeated until the water is clear after settling 5 minutes. The remaining sand is filtered out, dried and weighed. Sand grain from which the clay has been removed is passed through sieves of various meshes, and the weight caught in each sieve is determined. The *grain fineness number* is the number of meshes per inch of that sieve which would just pass the sand grains if they were averaged in size. It can be calculated from sieve data. (See *Foundry Sand Testing Handbook* published by the American Foundrymen's Society, 616 South Michigan Ave., Chicago, for complete directions on testing and classifying sand.)

Grain distribution is expressed by plotting the grain percentages by weight as obtained in the sieve test against the sieve numbers as a graph. The curve should be plotted on semi-log graph paper. Grain shape classification is by the terms *angular, sub-angular, round* and *compound.* Round and angular are self-explanatory. Sub-angular means grains which are somewhat angular with rounded corners, while compound grains are those in which two or more grains are cemented together. It is recognized that some sands consist almost entirely of grains of one shape while others consist of a mixture of grains of varying shape. Furthermore, a grain may be rounded-compound or sub-angular-compound, etc.

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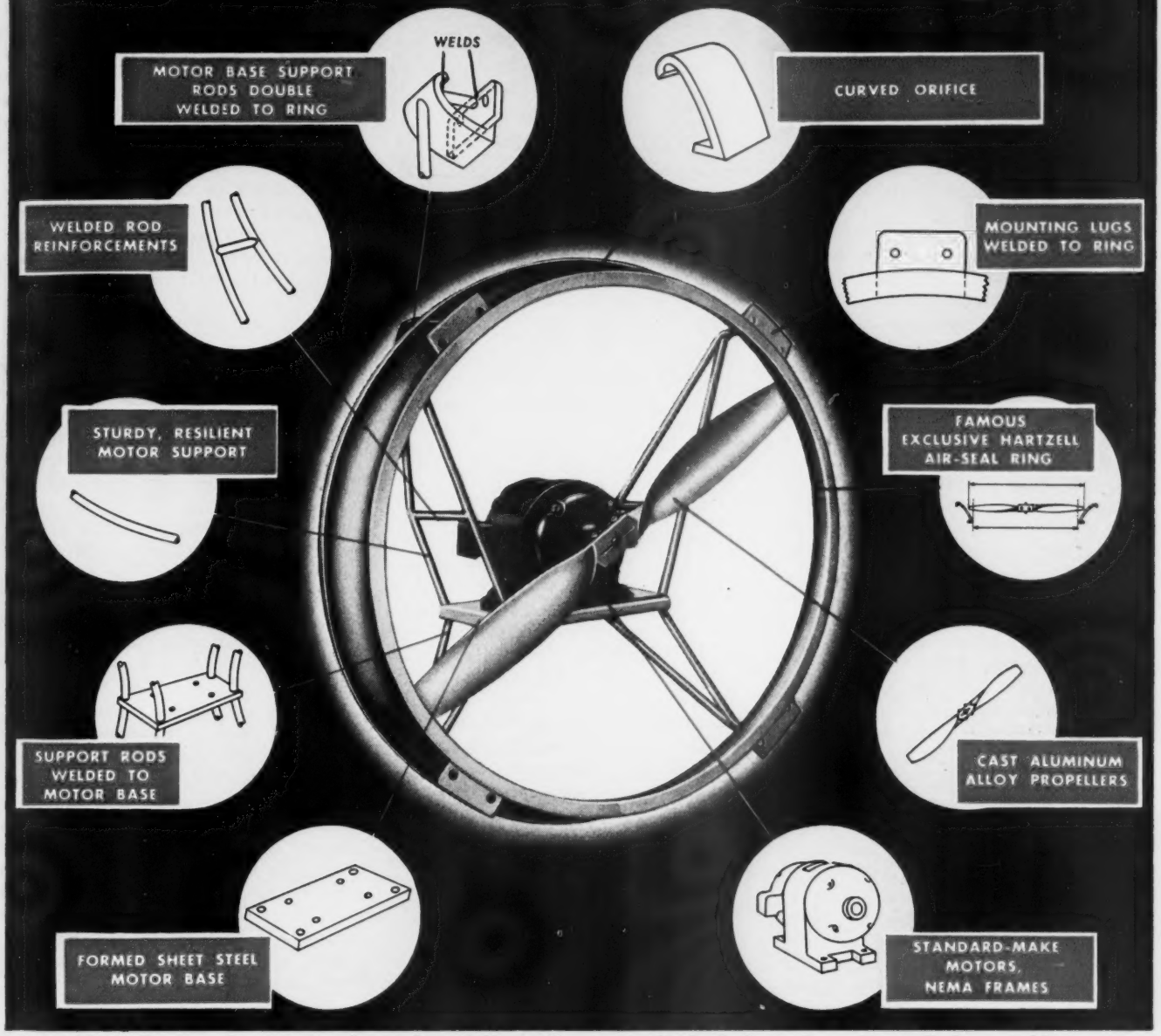
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PROPELLER-TYPE FANS AND BLOWEPS—ROOF VENTILATORS—UNIT HEATERS • ENGINEERING OFFICES IN PRINCIPAL CITIES

By EDWIN BREMER

Foundry DEVELOPMENTS

INTERESTING point brought out in a paper by W. B. Parkes on "Sand Testing and Its Interpretation in the Foundry," published in the December, 1950 issue of *Journal of Research and Development,* British Cast Iron Research Association, related to the difficulty often encountered in molding sands not giving a suitable "lift" even though the green compression test indicated that the sand was sufficiently "strong." To determine the "liftability" property the "shatter" test, which is simple and gives reproducible results, is proposed. It consists of dropping the standard 2-in.-diam sand test specimen from a height of 6 ft onto a steel plate. The shattered material is pushed carefully onto a ½-in. mesh screen next to and about 1 or 2 in. below the plate. Screen is not shaken, and the material remaining on it is termed the "shatter index."

Guide to utilization of sands of different shatter index follows: Below 50 per cent—very simple molds. Below 60 per cent—satisfactory for fairly simple molds, but complicated molds or those with heavy lumps may require rolling over. Below 70 to 75 per cent—adequate for most work. Below 80 to 85 per cent—may be necessary for large complicated molds or to lift heavy lumps. Over 90 per cent—it will be difficult to ram the sand to a sufficient hardness to prevent swelling in some parts of the mold.

* * *

IMPORTANT new refractory product, fused stabilized zirconia, has been developed by Norton Co., Worcester, Mass. Material in molded shapes is said to withstand temperatures up to 4600° F. Some of the applications mentioned for fused stabilized zirconia include containers and conveyors for molten steel, heating elements for electric furnaces, thermal insulation for high frequency induction and resistor wound furnaces, furnace lining bricks for gas synthesis at high temperatures in chemical industry, and setter plates for firing titanates used in construction of capacitors for electronic equipment. Material is a poor conductor of electricity at low temperatures, but an excellent conductor when subjected to high heat. In spite of its high bulk density it is a low conductor of heat, and a superior thermal insulator.

* * *

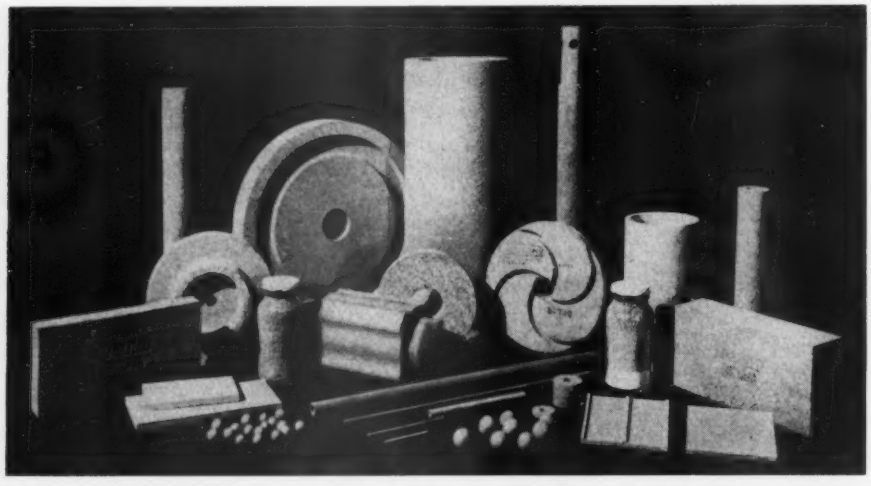
NAVAL Research Laboratory in Report 3693 describes a method of observing the same area of a specimen with both light and electron microscopes. Procedure is to locate the desired area under a light microscope and place a small punch mark in it or near it with a Tukon hardness tester. Specimen is coated with a parlodion (a form of nitrocellulose) film. Next, in an ordinary specimen mounting screen for the electron microscope one of the holes near the center is enlarged with a sharp needle, and the screen placed over the coated specimen so that the punch mark is aligned under one of the small holes adjacent to the large one. Replica and screen are then stripped from the specimen, and placed in the electron microscope.

* * *

INVESTIGATION of stress relief in magnesium-base alloy castings was conducted by R. J. M. Payne and published in the October, 1950 issue of the *Journal* of the Institute of Metals (London). He found that an anneal for 2 hr at 330° C in furnaces where the metal could be brought quickly to temperature provided about 95 per cent relief for the alloys containing 9.5 Al, 0.5 Zn, 0.3 Mn, and 8 Al, 0.5 Zn, 0.3 Mn without very marked effect upon mechanical properties. Likewise, it was found that the 2-hr treatment at 330° C followed by a 24-hr treatment at 180° C gave excellent stress relief with the 4.5 Zn, 0.7 Zr magnesium-base alloy. In the case of the 3 mischmetall, 0.6 Zr alloy it was found that it is best left in the as-cast state where small dimensional change resulting from release of internal stress can be tolerated. A small measure of stress relief can be secured by annealing for about 10 hr at 250° C with no detrimental effect on creep behavior at 200° C.

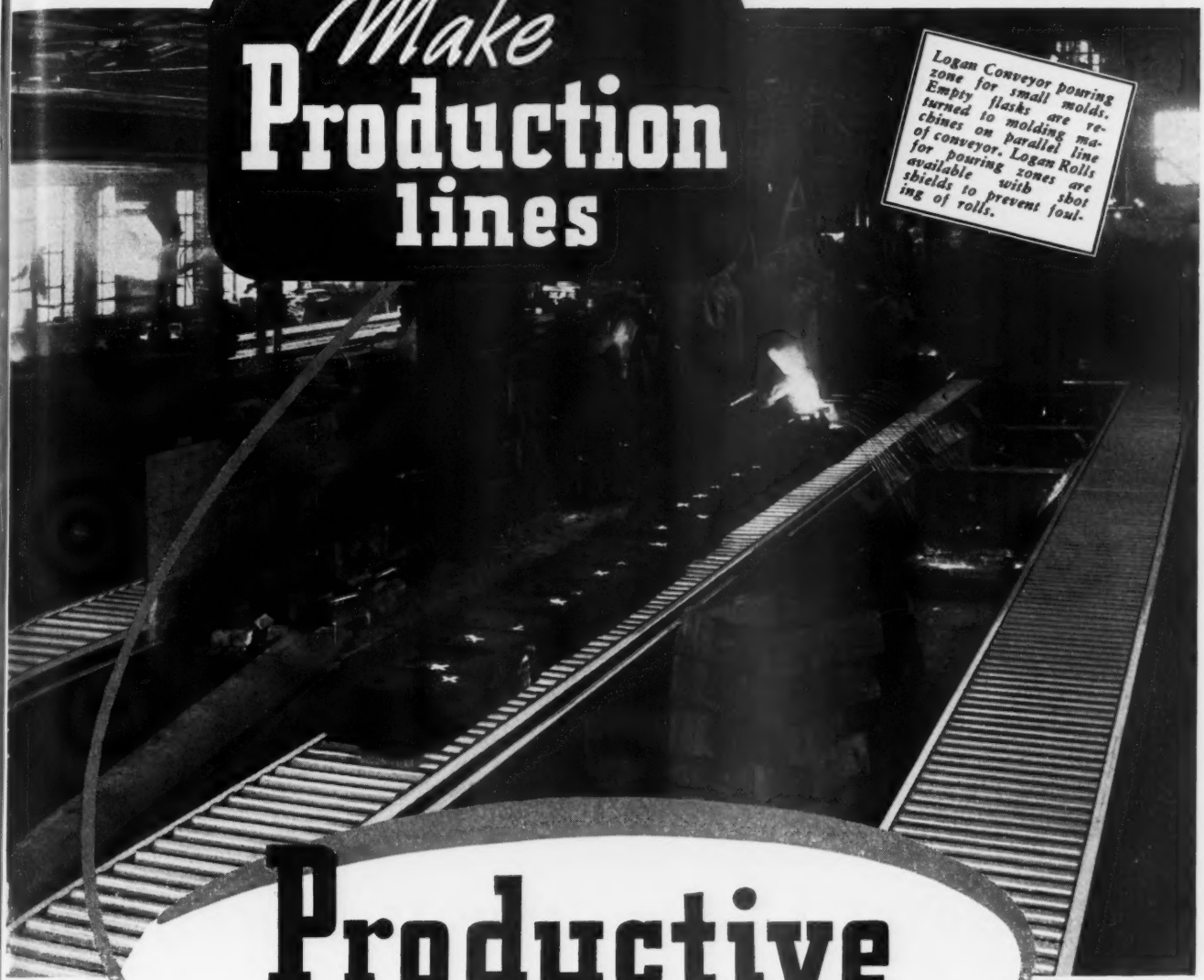
* * *

NEW TYPE camera developed under Signal Corps sponsorship produces finished pictures in two minutes; its 4 x 5 plates need no chemical processing, can be used over and over by merely wiping off the image. The camera employs an electrostatic-electrophotographic process in which light is recorded on a selenium-coated metal plate sensitized by an electrical charge as an invisible electrical image. Finely ground powder dusted across the plate is held by the charge and the image transferred to paper or other material coated with an adhesive layer. Plates are not affected by light unless sensitized, are immune to atomic radiation, and are about as speedy as orthochromatic black and white film.



Fused stabilized zirconia is available in molded shape as well as in grain form. Some of the products of this refractory material are shown here

Make Production lines



Logan Conveyor pouring zone for small molds. Empty flasks are returned to molding machines on parallel line of conveyor. Logan Rolls for pouring zones are available with shot shields to prevent fouling of rolls.

Productive Lines

"Increased productivity" is the keynote of the day. Conveyors can help toward this end in more ways than one. Logan Conveyors (a) keep molding and machining equipment operating at capacity (b) deliver molds and castings to operators at convenient working height (c) save time and effort between processes. In performing the above services Logan Conveyors have "a good name" among the nation's foremost foundries. Perhaps your foundry, too, can benefit from Logan's two generations of conveyor engineering and manufacturing experience. If you have a handling problem, write today for more specific information or for the nearest Logan engineer to call.

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LOGAN CO., 580 CABEL ST., LOUISVILLE 6, KY.

Left—Oxygen-arc tool in operation removing crack marked on flange of the sheave casting shown in the insert. Removal time was 0.10 minute

Above—Pillow block castings with defect encircled on casting at right. Time for removing similar defect from casting at left was 0.07 minute. Defect at front of casting on the left was removed in 0.03 minute

NEW TOOL

Removes Casting Defects *Quickly*

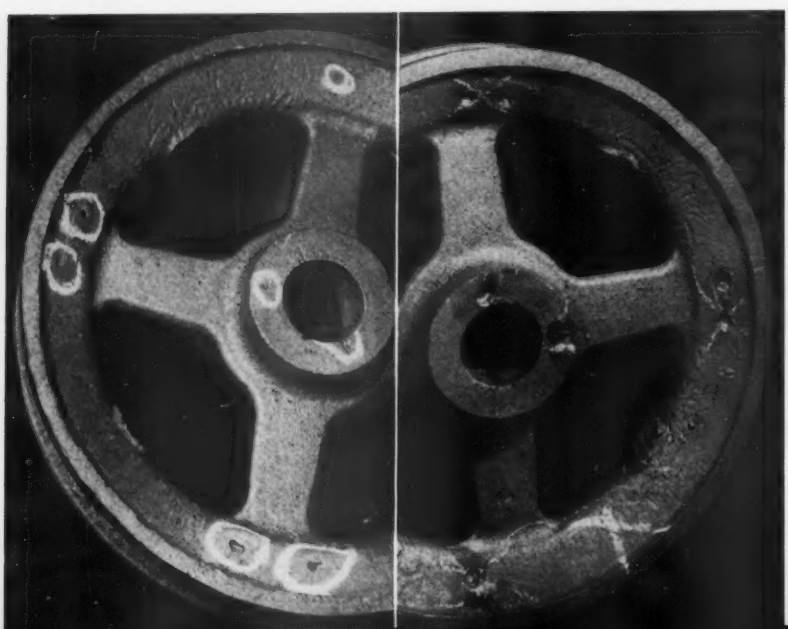
By ROBERT H. HERRMANN
Associate Editor
FOUNDRY

REMOVING casting defects at the rate of 1 cu in. of metal in ½ minute is said to be possible with a newly patented oxygen-jet electric-arc torch known as the Arcit Jet torch. Manufactured by Kwik-Arc Inc., 17204 Waterloo Rd., Cleveland 10, the tool is designed to speed cleaning room operations in removing sand and slag inclusions; cracks; porosity; shrink cavities; gas pockets from chills, chaplets, core anchors, and other casting defects.

The tool may be used on any metal that is electrically weldable. Light in weight and built for rugged foundry use, the tool operates from any type welding machine capable of delivering 300 or more amperes with ordinary welding voltage. It operates on alternating or direct current, and either polarity may be used. However, best results are obtained with reverse polarity direct current; furthermore, the lower the voltage setting, the deeper the arc penetration.

With a few exceptions the tool is made of brass. High-carbon spring steel is used for the electrode clamp, and a beryllium copper tip is incorporated at the outlet end of the brass tube through which the oxygen passes. Balance of the tube is

(*Continued on page* 166)



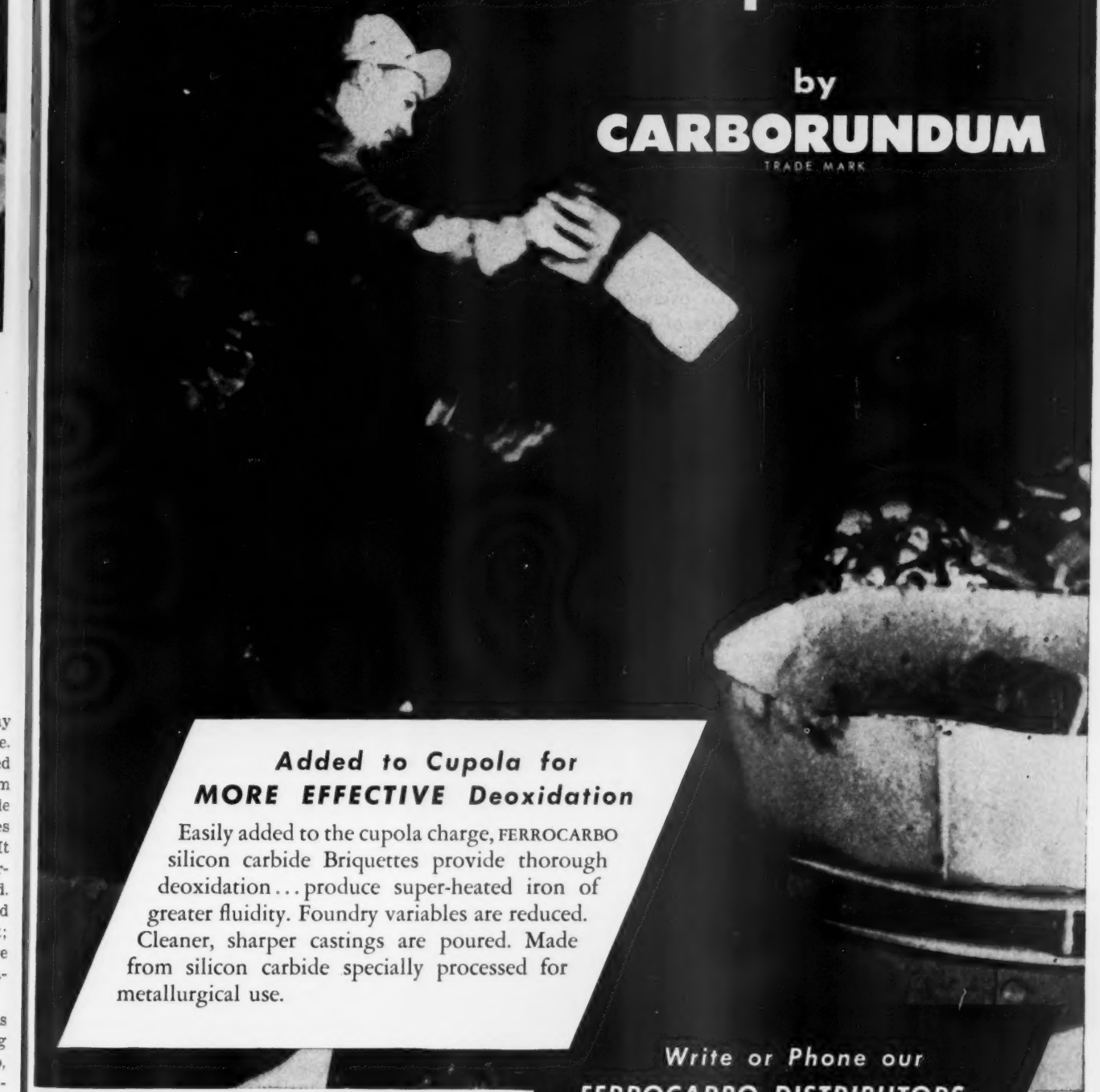
Seven sand defects and chill nail heads are marked on sheave casting at far left. The same casting shown at right has defects removed. Removal time was 0.29 minute

FERROCARBO Briquettes

by

CARBORUNDUM

TRADE MARK



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FERROCARBO Briquettes are manufactured under U.S. Patents 2,119,521 and 2,497,745. The process of making cast iron through utilization of silicon carbide is registered under U.S. Patent 2,020,171.

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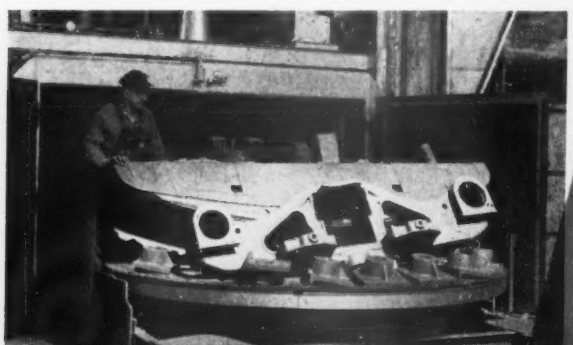
WHEELABRATOR® ROOMS eliminate the tedious, unhygienic labor of hand blasting

Cleaning large, unwieldly castings in an airblast room is always slow, expensive and unhygienic. To overcome these handicaps, American has perfected a complete line of Wheelabrator Rooms—employing unique work handling mechanisms—whose fast, economical performance has been proved in many actual installations. The Wheelabrator Room eliminates much of the manual labor required in airblast room operation; it provides positive exposure of the work to the abrasive barrage of one or more perfected Wheelabrator units; it eliminates the handicap of wearing protective clothing; it will handle any size work at high production speeds and at greatly reduced cost.

Write today for details on how a Wheelabrator Room can be profitably applied to your problem.



THIS WHEELABRATOR ROOM SAVES 32 MAN HOURS DAILY

A reduction of 32 man hours in direct cleaning room labor and a drastic slash in the cost of chipping and grinding were the immediate results of the installation of this Wheelabrator Room at American Hoist & Derrick Co., St. Paul, Minn.

Wheelabrator® AIRLESS BLAST CLEANING

American

OFFICES IN PRINCIPAL CITIES

AMERICAN WHEELABRATOR & EQUIPMENT CORP., 505 S. Byrkit St., Mishawaka 2, Ind.

(*Continued from page* 164)

covered with black mirror fiber. At the end of the handle are facilities for a standard No. 1 cable welding machine connection and a standard ⅜-in. oxygen hose connection. Oxygen under pressure of 10 to 100 psi may be used, and a restrictor valve incorporated in the tool governs volume of oxygen emitted at the tip. An open-shut valve controls flow of oxygen as needed. An insulated conductor delivers power to a specially designed 5/16-in. copper-coated, solid graphite electrode which is clamped rigidly in an adjustable holder.

Operation of the tool is comparatively simple, and the company claims that the average person can use the tool effectively after approximately 20 minutes instruction. With the correct ampere and oxygen pressure setting, an electric contact is made

between the defective casting area and the electrode. The electrode is withdrawn to form an arc, which produces a turbulence of molten metal, engulfing the defect. At this point the quick-acting oxygen valve is opened, causing a crossfire of oxygen to be sent into the turbulent, impure metal. The oxygen blasts and burns out the entire melt, extinguishing the arc and cooling the base metal to below the critical point, thus avoiding craeking. The resultant clean, bowl-shaped cavity facilitates weld penetration when the casting is repaired. With sufficient volume of oxygen, the harmful carbon content generated while melting with the carbon arc is eliminated, thus bringing metal analysis back to normal range.

Because the operation is extremely fast, thermal conduction and expansion are practically zero. Parent metal in and around the cleaned area may be touched with the bare hand within seconds after the defect has been removed. Furthermore, the operation is said to remove a minimum of good metal with the defect. Ef-

fect of the tool is to float the defect away from the good metal. Consequently, a minimum of weld metal is required to fill the resultant cavity. Another point of interest is that the castings do not require clamps or fixtures to hold them in place for working, and positioning and repositioning is minimized. No force is applied against the casting for removal of the defect with this tool.

Slight skin hardness is developed during the removal operation, but this is said to be dissipated by weld metal penetration. Practice indicates that the repair weld and the union of weld and parent metal is machinable.

Atlantic Foundry Co., Akron, O., has conducted experiments with the tool, results of which have shown reduced costs, low man-hours on casting cleaning and fast flow of castings through the cleaning room. Illustrations of work done on steel castings at Atlantic Foundry are shown with this article.

A number of other foundries have incorporated the tool in their cleaning departments for production operation on both large and small castings.

Book Review

Statics and Strength of Materials, by Jasper O. Draffin and W. Leighton Collins, cloth, 398 pages, 6 x 9 in., published by Ronald Press Co., New York. Price $6.50.

This book is designed as an elementary text covering statics and strength of materials, understandable by students in technical and architectural courses who do not expect to pursue a rigorous engineering curriculum of four or five years, and who do not carry their mathematics beyond college algebra and trigonometry.

In statics, coplanar force systems are treated in detail by the algebraic method, and a chapter is devoted to explanation of force systems in space. The strength of materials portion covers simple structural elements involving direct stress, including welded connections, torsion, bending, and column action. Data are presented for the more modern materials, such as lightweight alloys, high-strength steel, and plastics. Resistance of materials to energy, creep, repeated loading and stress concentrations is covered briefly.

General principles and their application are stressed. Explanations are given in detail, the presentation making use of free-body diagrams to emphasize the geometric interpretation and physical visualization of the problem rather than the purely mathematical consideration.

Dustube efficiency pays off 3 ways

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2 improved working conditions
3 better community relations

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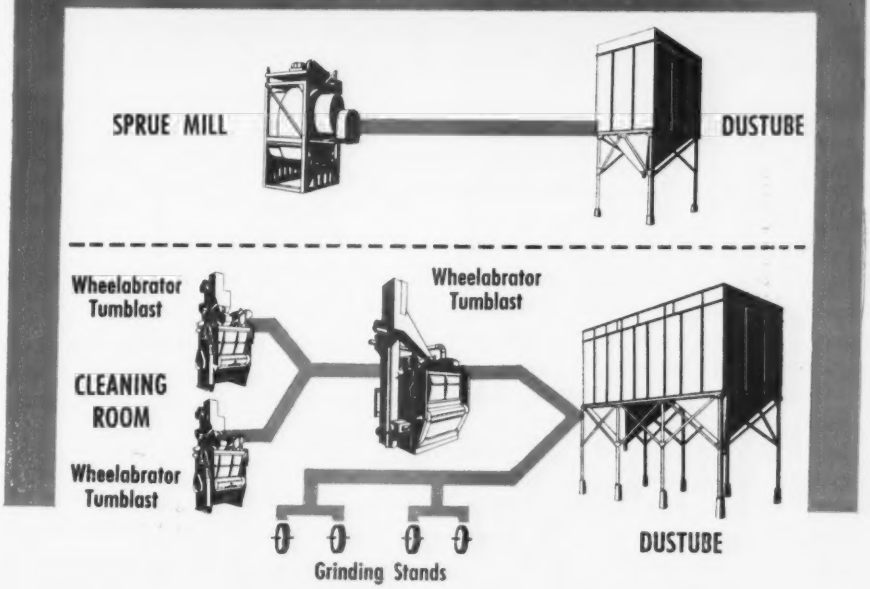

Performance you can expect from a Dustube is illustrated in the manner in which a severe dust problem was solved at Liberty Foundries Company. Dust which had formerly escaped into the atmosphere is now trapped with virtually 100% efficiency with Dustube Collectors. In fact, a recent study revealed one of the lowest dust counts of all foundries in the state.

"The Dustube Collectors have been a profitable investment" says Mr. C. M. Dale, Vice President, "for numerous reasons: (1) Profit margins are greater as the Dustubes cost less to operate and maintain; (2) The Dustubes effectively prevent all dust from permeating the atmosphere making our foundry a better place in which to work; (3) Dust which formerly had been exhausted into the neighborhood is now controlled and collected."

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ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

Extra-Low-Carbon STAINLESS STEEL

New Type Chromium-Nickel Steels Have Added Corrosion Resistance

New and improved austenitic stainless steels of the 18-8 type have been developed which have superior corrosion resistance after being exposed to heat. These steels, known as extra-low-carbon stainless steels, were designed especially for use in welded and stress-relieved equipment that is exposed to more severe corrosive conditions than are normally encountered by other types of straight 18-8 stainless steel.

Under severe corrosive conditions, intergranular attack may occur in some of the higher carbon grades of austenitic stainless steels that have been subjected to the temperature range of 800 to 1600 deg. F. during welding or hot forming operations. It is generally agreed that this type of corrosion is caused by complex carbides that are formed at the grain boundaries of the stainless steel during heating.

The effect of heat is rarely harmful in the ordinary fabrication of stainless steel for most applications, such as in architecture, the food and dairy industries, in hospitals, and in the home. However, in the chemical and other allied industries, where stainless steel is used in the handling of very corrosive chemicals, these new extra-low-carbon stainless steels should most certainly find wide use.

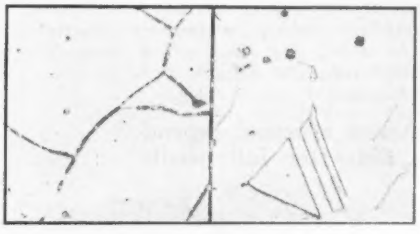


Fig. 1 Left: Carbide precipitation at the grain boundaries of an 18-8 stainless steel, containing 0.059 per cent carbon, after being held at 1200 deg. F. for 1 hour. Right: Absence of carbide precipitation in 18-8 stainless steel of 0.03 maximum carbon content, after being held at 1200 deg. F. for the same length of time.

In general, there are three ways in which the precipitation of carbides can be controlled in stainless steel:

1. Heat-treating so that the carbides present are dissolved.
2. Alloying with an element, such as columbium, tantalum, or titanium, that will tie up the carbon in the form of a harmless carbide.
3. Decreasing the carbon content of the steel.

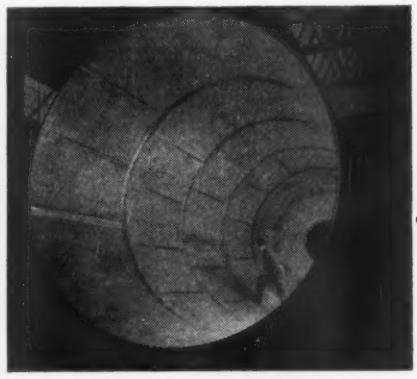


Fig. 2. The new extra-low-carbon stainless steels are especially suited for large types of process equipment, such as this fractionating tower. They require no heat-treatment after welding.

Heat-Treatment After Welding

Before the development of extra-low-carbon stainless steel, or of the "stabilized grades," one means for preventing intergranular corrosion was to heat-treat stainless steel that had been subjected to the dangerous temperature range, so that the precipitated chromium-carbides would go back into solid solution. It was found that when a welded part was heated to temperatures of 1950 to 2000 deg. F., and then cooled rapidly, most of the carbides were retained in solid solution. This extra heat-treatment is sometimes impractical, however, because of the design or massive size of some types of welded equipment.

Decreasing Carbon Content

A recent development in preventing intergranular corrosion has been the extra-low-carbon stainless steels. To be substantially harmless in stainless steel for as-welded or welded and stress relieved chemical equipment operating at temperatures under 700 deg. F., carbon must not be present in quantities over 0.03 per cent.

In 1937, ferrochrome with 0.03 per cent maximum carbon was first produced for the steel industry by ELECTROMET. This product has helped make it possible to produce very-low-carbon stainless steels—steels that are completely immune to intergranular corrosion after welding or after subjection to a stress-relieving heat-treatment.

The amount of stabilizing element that is necessary to "fix" carbon in stainless steel is in direct proportion to the carbon content of the steel. Therefore, the lower the carbon the less is the amount of stabilizing element required. Lowering the carbon content is an efficient means of conserving columbium, tantalum, and titanium.

Metallurgical Service Available

If you use welded stainless steel equipment, it will pay you to investigate the advantages of using extra-low-carbon steels. If you produce stainless steel, our metallurgists will be glad to give you technical assistance in the use of ferrochrome of 0.03 per cent maximum carbon. For further information, write to the nearest ELECTROMET office.

For a more detailed account of the properties of extra-low-carbon stainless steel, write for a free copy of the technical paper, "Resistance to Sensitization of Austenitic Chromium-Nickel Steels of 0.03% Max. Carbon Content".

The term "Electromet" is a registered trademark of Union Carbide and Carbon Corporation.

Employee Co-operation Key to

Increased Productivity

FREQUENTLY the key to greater productivity in any plant, mill or foundry is the status of its labor relations. Management can take steps to increase productivity by installing better tools and methods, but without the co-operation of workers, gains will be small if any.

Many times the major step in the direction of improved efficiency is in winning the approval and help of labor. With that accomplished, the battle is more than half won.

A case in point was the experience of our firm with an eastern foundry. This foundry, producing gray iron castings, suffered from low productivity, very high molding costs and excessive scrap. Labor had turned down management requests for greater output per worker per day. Yet, in less than six months these changes were effected:

1. Machine molding output was increased 35 per cent.
2. Floor molding output improved 25 per cent.
3. Overhead was reduced materially.
4. Grinding and cleaning costs were cut almost 35 per cent.
5. Take-home pay of employees rose almost 15 per cent.

How were these very satisfactory results achieved? Technically speaking, production standards were developed and an incentive pay plan instituted for both direct and indirect labor. In some instances methods were changed. For example, machine molders had been performing both pouring and molding operations; pouring was delegated to a pouring crew.

However, the accomplishments of this program did not result from development of standards and the application of wage incentive principles, but came about through convincing the employees that these standards were fair and equitable. Where output was increased, much of the credit went to greater effort on the part of employees.

The number of production workers employed at the time of our initial contact with the foundry was 50 and they were represented by a well organized union.

A preparatory study of the foundry revealed the following facts:

1. Only six machine molders were working under piece-work rates, which were based on both molding and pouring.
2. All floor molding, melting, pouring, shakeout, grinding and foundry labor was on a straight day work basis.
3. Productivity of the group as a whole did not exceed 70 per cent of a normal day's work.
4. Indirect labor costs were excessive.
5. Scrap was excessive.
6. Labor as a whole was opposed to any type of incentive plan.
7. Supervision was handicapped by the absence of accepted yardsticks of productivity against which comparisons of actual production could be made.
8. Immediate supervision in the foundry was not aggressive.

Once the study was made, we called a meeting of employees and told them the cold hard facts as set forth above. No punches were pulled.

By WILLIAM R. PRADA
Chief Engineer
John A. Patton Management Engineers Inc.

Nothing was hidden. We emphasized that management had to receive a day's work for a day's pay and if this could not be realized, we would recommend that the operations of the foundry be terminated. (The company has two other foundries.)

The union's first question at this point was how many molds did management expect from each man. Union representatives indicated that much of their opposition stemmed from the fact that previous attempts had been made to establish production figures arbitrarily.

They were told that standards had to be based on facts and observations, not opinions, and that these standards had to contain allowances for such factors as personal unavoidable delays, scrap and the like. We pointed out that the size of the mold had no bearing in determining what the production per hour or per day should be. They were told that the type of pattern would be the determining factor.

It was explained that one or two members of the union bargaining committee would work closely with our staff in developing standards for both direct and indirect labor. Workers were told that we had to have assurance of their co-operation prior to undertaking the job.

The union's business agent voiced his general opposition to incentive principles but agreed to leave the matter up to the members. The employees voted to go along with the plan on a trial basis and selected the chief steward to work with our organization.

There were some difficulties encountered but finally the entire program was worked out. To a large extent, excellent results were achieved by the program because the chief steward was convinced that the standards set up were fair and equitable. Once he was convinced, his assistance in selling the plan to the employees was tremendous.

The training the steward was given made him cost conscious, unbiased in his thinking, and secure in his belief that standards as developed under this program would continue in effect as long as the methods under which they were established continued in effect. Other foremen in the plant also received training with the result that supervision improved considerably throughout the foundry.

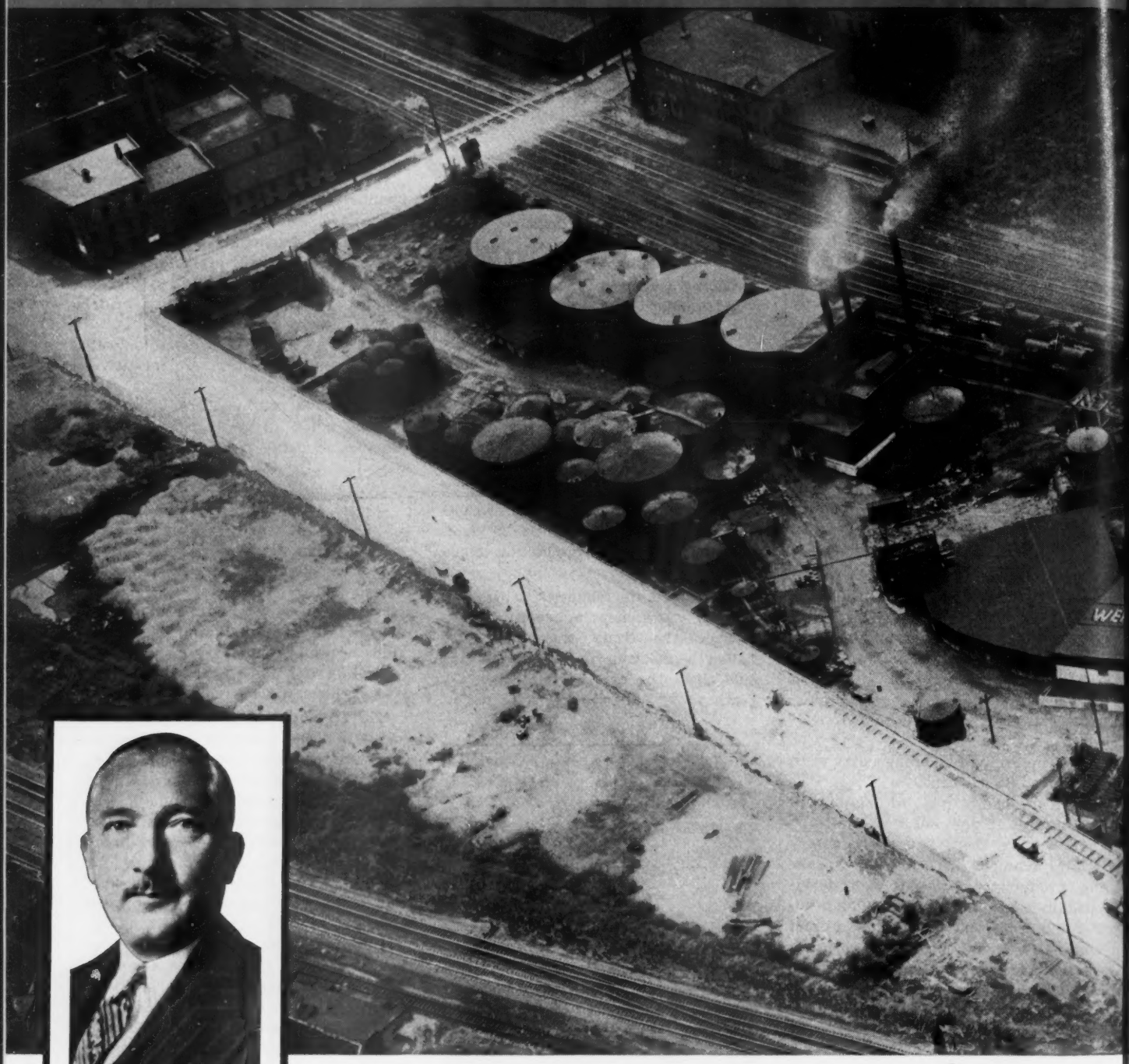
This case, while a difficult one, was not unusual in its problems nor were the accomplishments of the program unusual. They came as a result of a policy that can be widely applied in any business — namely, employees should be informed of any changes in equipment, methods or planning. They should be made to feel that they are partners in any new program.

The three axioms of employees relations should be:

- ...information breeds understanding
- ...we all want to be told in advance
- ...we will all co-operate with a program in the same proportion to which we are a part of that program.

Such a policy can bring improved labor relations and, consequently, better productivity to any business.

Here's Our Plant Now Making



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Activities of Foundry GROUPS

Central Illinois

JANUARY meeting of Central Illinois Chapter of the AFS had as its featured speaker W. W. Levi, chief metallurgist, Lynchburg Foundry Co., Lynchburg, Va. Mr. Levi stated that his topic, "Cupola Operation" is one of the most controversial subjects of the foundry industry. He then presented to the 85 members and guests present some facts that he had observed and studied and he illustrated the technical data by several slides. These gave considerable information on the front slagging cupola and some interesting facts on cupola fuels.—*Robert Paluska, Caterpillar Tractor Co.*

Quad City

A REVIEW of his trip to England was presented by Hyman Bornstein, Deere & Co., Moline, Ill., as a coffee talk at the Jan. 15 meeting of Quad City Chapter of the AFS.

He visited the British Cast Iron Research Institute and was impressed with its work. In his opinion the institute does a fine technical job, better than any similar group in the United States. Using a recent investigation as an example, Mr. Bornstein pointed out the committee consisted of not only top management and technical men, but also those who actually performed the jobs, such as molding, core making and other work connected with a foundry. The committee was to determine why foundries in the United States did a better production job than those in the British Isles.

After visiting foundries in Britain for two months, the committee studied operations in the U. S. for three months. Their findings showed the average tempo of production in the British foundries is slower than in those of the U. S., due primarily to better incentives in the United States. Lack of incentive in Britain is due primarily to the excessively high income tax. The government takes such a large portion of the additional income that the take-home pay does not compensate for the extra effort.

Ray A. Witschey, A. P. Green Fire Brick Co., gave the technical talk on "Refractories." He spoke on the commonly used refractories and stated that the average foundryman finds it difficult to classify the common refractories: Acid—composed primarily of $Si\ O_2$; basic—CaO, MgO, or Al_2O_3; neutral—C or Cr. There is a great variety of these refractories available and they are provided in numerous forms such as tiles, bricks and special products. In purchasing refractories, he advised buying by composition.

Mr. Witschey advocated purchase of standard forms for economical reasons and because they are more readily available. Plastic refractories are finding more application and mortars are also receiving more attention. Refractory practice in foundries is usually the result of past experience, but Mr. Witschey believes most foundries are lax in investigating new refractories to reduce cost. Throughout the talk, he showed slides illustrating manufacturing processes and applications of refractories in furnaces and ladles.—*Elmer C. Zirzow, Deere & Co.*

Twin City

FIRST meeting for the new year for Twin City Chapter of the AFS was held Jan. 9 at the Covered Wagon, Minneapolis. An excellent turnout was present to hear Joseph A. Gitzen, president, Delta Oil Products Co., Milwaukee, speak on "Cores and Core Sand Additives."

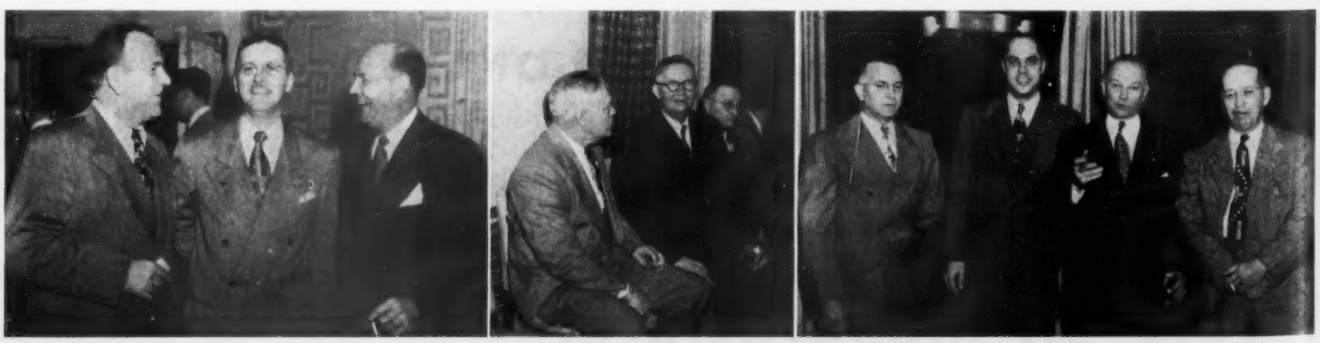
According to Mr. Gitzen, the procedure in making cores is not as closely guarded in the industry today as it was years ago. He then discussed materials and equipment used in making cores and the reasons for the use of each. These are: Sand, binders, water, and baking oven. Binders dominated the discussion and included cereals, pitch, resins, core oils, plastics, clays, silica flour and iron oxide. In conclusion, Mr. Gitzen stated that poor mulling and baking conditions can turn potentially good core sand mixtures into poor cores.—*J. D. Johnson, Archer-Daniels-Midland Co.*

Wisconsin

FOUR sectional meetings featured the Jan. 12 meeting of Wisconsin Chapter of the AFS held at the Schroeder Hotel, Milwaukee.

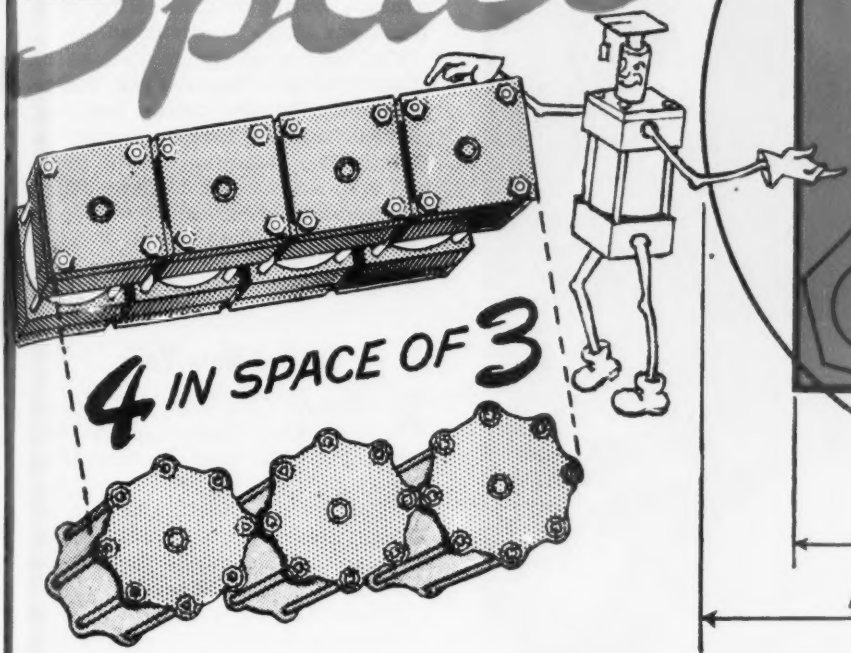
The gray iron and malleable groups held a joint meeting at which "Do Core Blowers Belong in My Shop?" was discussed. The speakers included: Zigmond Madacey, Caterpillar Tractor Co., Peoria, Ill.; L. P. Robinson, Archer-Daniels-Midland Co., Cleveland; and Lawrence D. Pridmore, International Molding Machine Co., LaGrange Park, Ill. Durward R. Hutchison, Nash Kelvinator Corp., Kenosha, Wis., acted as chairman

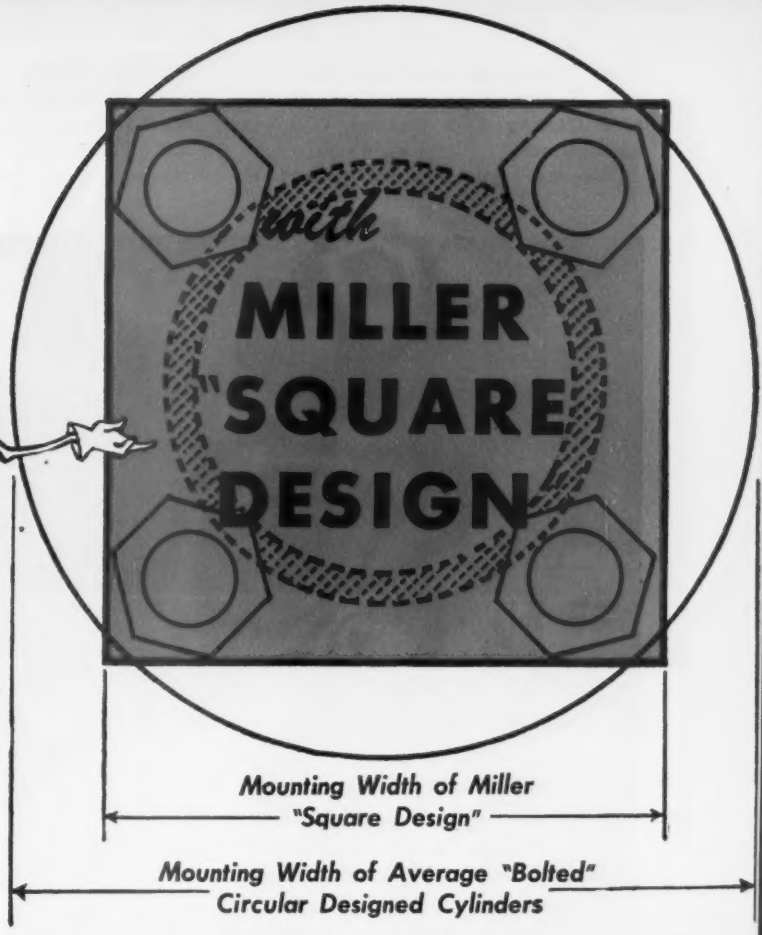
(*Continued on page* 174)



QUAD CITY Chapter of the AFS held its annual Christmas party at Hotel Blackhawk, Davenport, Iowa, Dec. 8

Save Space





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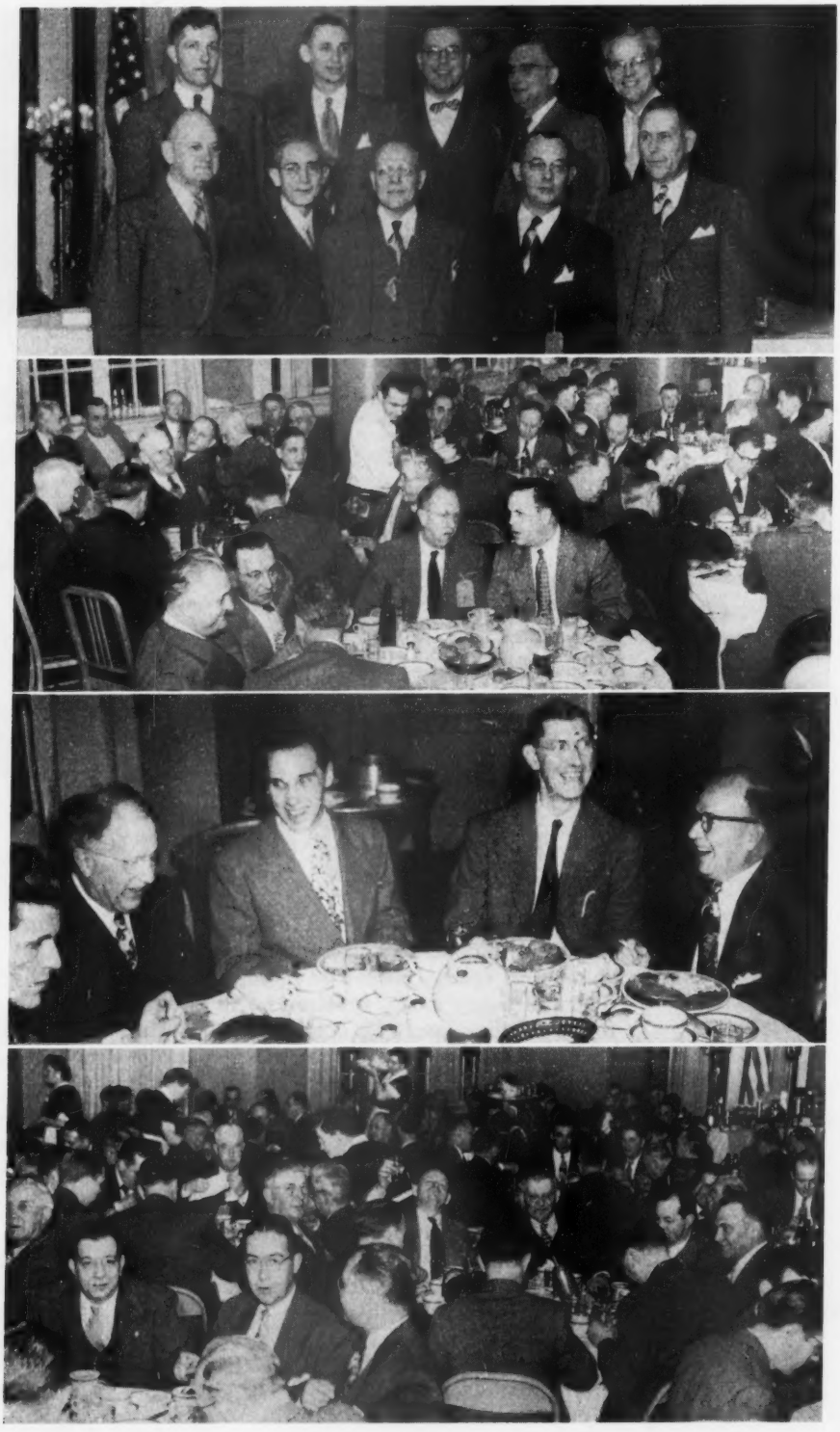
(*Continued from page* 172)
with Martin Harder, Lakeside Malleable Casting Co., Racine, Wis., as co-chairman.

The steel group heard Robert P. Schauss, Illinois Clay Products Co., Chicago, speak on "Fundamentals of Steel Foundry Sands." Erwin G. Tetzlaff, Pelton Steel Casting Co., Milwaukee, was chairman with George V. Jedniak, Sivyer Steel Castings Co., Milwaukee, co-chairman.

A sound film, "This Is Aluminum," was shown at the pattern session. The speaker was J. R. Patterson, Aluminum Co. of America. A. Fischer, Charles Jurack Co., Milwaukee, acted as chairman assisted by H. Arneson, Spring City Pattern Works, Waukesha, Wis., co-chairman.

The nonferrous group had as its speaker William Romanoff, H. Kramer & Co., Chicago, whose talk was entitled, "Bearing Bronzes—Make 'em Right." The chairman for the group was J. Kammermeyer, Federated Metals Division, American Smelting & Refining Co., Chicago, with Kenneth Jacobs, Standard Brass Works, acting as co-chairman.—*John E. Hubel*



CENTRAL NEW YORK Chapter of the AFS held its Christmas party Dec. 9 at Hotel Onondaga, Syracuse, N. Y., with 240 attending. Party committee members are shown at top. Left to right, front row, are: D. J. Merwin, Oriskany Malleable Iron Co.; Frank Wheeler, Kimman & Wheeler; Jake Kratz, Crouse-Hinds Co.; Bruce Artz, Pangborn Corp., and J. W. Ogden, Cleveland Tramrail Syracuse Co. Back row, left to right: Nate Meloon, Meloon Bronze Foundry Inc.; Robert Wright, U. S. Graphite Co.; James Ochsner, Crouse-Hinds Co., committee chairman; John Feola, Crouse-Hinds Co., and David Dudgeon Jr., Utica Radiator Corp.

Central New York

REGULAR meeting of Central New York Chapter of the AFS was held at the Roof Garden, Hotel Onondaga, Syracuse, N. Y., on Jan. 12. Chairman David D. Dudgeon Jr., Utica Radiator Corp., welcomed the 70 members and guests present and introduced new members.

Speaker of the evening was John T. Schenck, president, Engleberg Huller Co., Syracuse, and president of the Manufacturing Association of Syracuse. His subject was, "Where Do We Go from Here?" Mr. Schenck discussed the problems common to all types of industry which in his opinion are caused by confused thinking, from government leaders to the citizenry.

Following Mr. Schenck's address, the meeting divided into three round table discussion groups. The gray iron section was under the leadership of J. Francis Dobbs, New York Air Brake Co., Watertown, N. Y. Topic of discussion was "Gray Iron Speaks for Itself." The malleable iron group under D. J. Merwin, Oriskany Malleable Iron Co., Utica, N. Y., considered "Annealing." The nonferrous section under W. A. Mader, Oberdorfer Foundries Inc., Syracuse, N. Y., discussed "Metallurgical Aspects of the Defense Program in Copper and Aluminum Alloys."—*James W. Ogden, Cleveland Tramrail Syracuse Co.*

Northeastern Ohio

NORTHEASTERN Ohio Chapter of the AFS featured three sectional sessions at its Jan. 11 meeting at Tudor Arms Hotel, Cleveland.

At the session covering "Basic Cupola Practice," some of the fundamentals in cupola operation were discussed by Daniel E. Krause, executive director, Gray Iron Research In-

(*Continued on page* 176)

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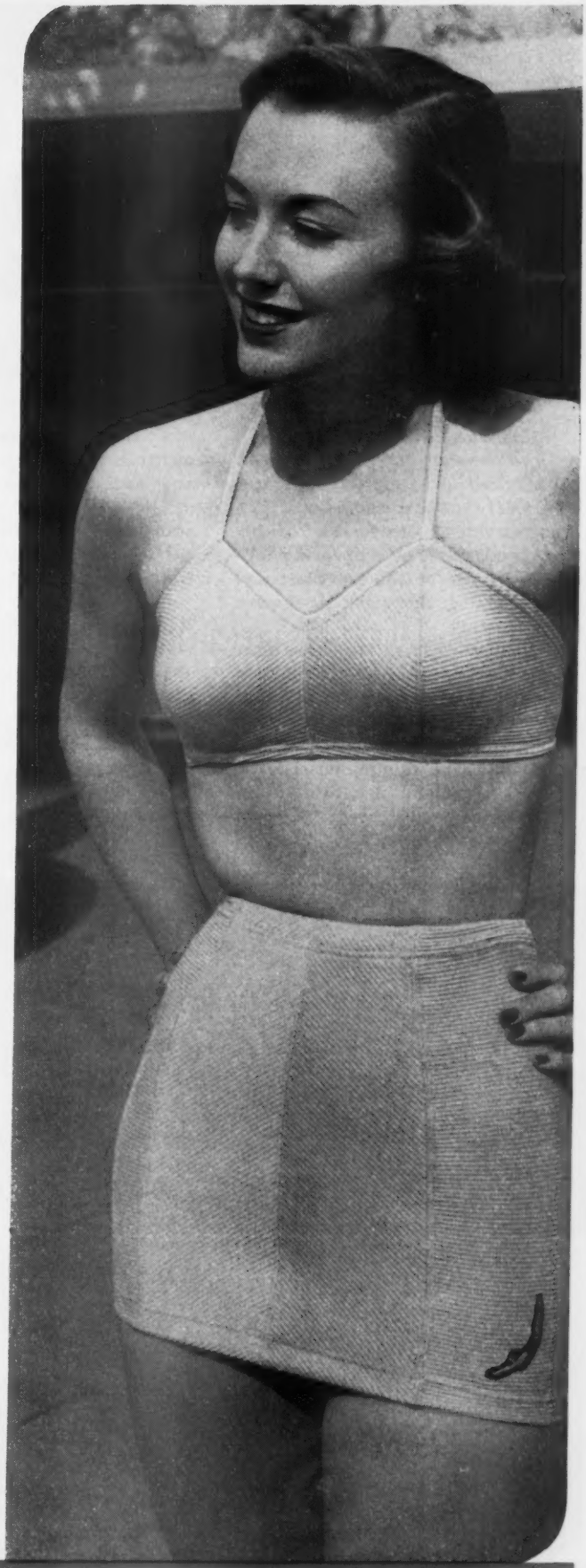
If you don't agree that SUPER-ANNEALSHOT and GRIT are the best and most economical malleable abrasives you've ever used—return the unused quantity for refund—AT OUR EXPENSE.



METAL BLAST, INC.

872 East 67th Street • Cleveland 3, Ohio

NORTHEASTERN OHIO Chapter of the AFS held its Christmas party Dec. 14 at Hotel Carter, Cleveland. Photo reproduced above, showing part of the group of 1000, was taken by Tom Gallagher, Lake City Malleable Co., Cleveland

(*Continued from page* 174)

stitute, Columbus, O. This session was presided over by Dave Clark, Forest City Foundries Co. Mr. Krause devoted considerable of his talk to methods of improving operations by use of the hot blast and by conditioning the blast to remove excess moisture.

Economies incident to hot blast use include saving of fuel, reduction in oxidation losses, more uniform iron analysis and increased melting rate. Bridging directly above the tuyeres also is cut to a minimum. Desirability of controlling moisture in the cupola blast is evidenced from the fact that high moisture cuts the melting rate, increases manganese and silicon losses and carbon pickup of the iron. Data show that tensile, transverse and impact strengths of the iron decline with increased moisture, and the chill depth is greater.

"How Pattern Construction and Engineering Can Affect the End Results in Foundries" was discussed by Fred W. Smale, foundry engineer, National Malleable & Steel Castings Co., Cleveland, with James Martin, Royal Pattern Works Co., as section chairman.

Mr. Smale stated that a pattern is only a means to an end—a good casting. Patternmakers should govern their efforts accordingly, and their success can be determined by relating foundry scrap to design of the pattern. He offered a number of suggestions for improving patterns. Partings must be put in the proper place to permit easy molding, proper gating, and avoid leaving flashing on the casting. Taper and draft should be specified on all pattern drawings. Edges of coreprints should be rounded or tapered so cores can be placed easily without knocking sand into the cavity.

He concluded by advocating that every pattern job should be viewed as a new one, with new ideas incorporated to improve upon previous patterns for similar jobs, the purpose being to better the resulting casting.

With John Davenport, Fulton Foundry & Machine Co., in the chair, Joseph E. Peaselee, work simplification engineer leader, Republic Steel Corp., Cleveland, defined "Work Simplification" as a program of training supervisors in a pattern of thinking which enables and encourages them to improve methods and by so doing make work easier for themselves and other employees. The program is based on the principle that any job, if subjected to persistent, intelligent, and well guided study, may be improved. The object is to make a better product, at a lower cost, at the right time, and with the least human effort.

Rev. Father R. T. Deters, dean of the night school, John Carroll University, Cleveland, was the coffee speaker, and he discussed "Education at the Plant." He described the university's new plan of offering courses at plants, offices, meeting halls, or other suitable meeting places where a suitable number of students can be assembled to form a class.—*William G. Gude, Pat Dwyer, and Robert H. Herrmann.*

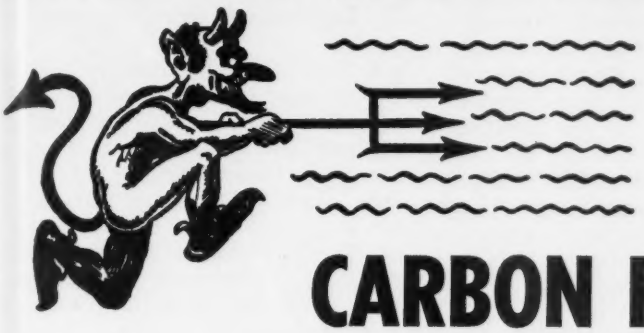
EASTERN NEW YORK Chapter of the AFS held its third annual stag Christmas party at Circle Inn, Lathams, N. Y., Dec. 19. Views of the party are shown above

Reading

HIGH school training for jobs in the foundry industry was advocated by Fred G. Sefing, International Nickel Co., New York, and a trustee of the Foundry Educational Foundation, before the Jan. 16 meeting of the Reading Foundrymen's Association held at the Berkshire Hotel, Reading, Pa. There is need now for more men in the industry and the opportunities are as good or better in foundry work than in most other industries. Mr. Sefing pointed out that most vocational and high schools have courses in electricity, carpentry,

(*Continued on page* 178)

For Lower Casting Costs
More and More Foundries Are Using



Soffel's
CARBON FREE LIQUIDIZER

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is the leader in major foundries for use on both ferrous and non-ferrous metals and also in ingot production. It is the original scientific, non-carbon, exothermic compound for feeding heads and risers.

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is different from ordinary head compounds in many ways:

(1) It is carbon free and Exothermic
(2) It is an insulator to heat loss
(3) It is lighter in weight than most head compounds

Carbonaceous materials, regardless of their composition, will cause carbon pickup, segregation, non-uniform grain structure, and hard spots under risers and in castings. These materials contribute no added heat value or increased temperatures to the feeding metal and only act as an insulating cover. On the other hand, SOFFEL'S CARBON FREE LIQUIDIZER is entirely free from carbon, sulfur, and phosphorus and will not contaminate a metal or alloy in any way.

When applied on the heads or risers, CARBON FREE LIQUIDIZER reacts within itself *exothermically*, producing a temperature above 3200° F. It actually increases the temperature of the feeding metal to a point well above that of the metal in the main body of the casting, thus ensuring that the feeding metal will be the last to freeze. In this manner, shrink cavities in the casting caused by premature freezing of the feeding metal are eliminated. After the exothermic action has ceased, the LIQUIDIZER forms a soft refractory insulating blanket on the metal. This confines the heat generated by the LIQUIDIZER and aids in maintaining the desired high temperature of the feeding metal in the heads or risers.

SOFFEL'S NEW THERMOTOMIC HOTOP

A new exothermic carbon free LIQUIDIZER for heads and risers of castings of iron or steel. Does not contain any powdered metal and can be used on any ferrous alloy without danger of contamination. In many foundries riser height reductions of 50 to 70% have been obtained; individual casting yields have been increased as much as 15 to 20%. SOFFEL'S THERMOTOMIC HOTOP will develop well over 4000° F. without affecting the chemical analysis in the heads or castings. It forms a porous insulating slag cover which further delays cooling of the metal in the heads and aids directional solidification. SOFFEL'S THERMOTOMIC HOTOP is different than any other head compound on the present market. Order a trial sample which is guaranteed to produce a reduction of riser heads.

Beware of Imitations:

We are the originators of Exothermic Carbon Free Liquidizer

PITTSBURGH METALS PURIFYING COMPANY

Manufacturers of Quality Fluxes and Purifiers for All Metals and Alloys
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METROPOLITAN Chapter of the AFS heard a talk on "Ductile Iron" by Harold L. Ullrich (right), Sacks-Barlow Foundries Inc., Newark, N. J., Jan. 8. A. P. Gagnebin (left), International Nickel Co., was technical chairman at the meeting. Photo by courtesy of John Bing, Metropolitan Refractories Corp.

(*Continued from page* 176)

welding and other crafts, but few teach foundry work. He urged members to invite high school classes to tour foundries so that students may become acquainted with the type of work done.

"Men and Molds," a motion picture showing the job opportunities in the foundry industry and produced by Lynchburg Foundry Co., Lynchburg, Va., was exhibited.

Newly elected president, George C. Kissell, Fairmount Foundry Co., Hamburg, Pa., presided.—*W. I. Cassidy, Reading Foundrymen's Society*

Metropolitan

DUCTILE Iron was discussed at the Jan. 8 meeting of Metropolitan Chapter of the AFS. Principal speaker was Harold L. Ullrich, works manager, Sacks-Barlow Foundries Inc., Newark, N. J., with A. P. Gagnebin, metallurgist, International Nickel Co, New York, serving as technical chairman.

Mr. Ullrich stated that ductile iron is one of the most recently developed engineering materials and was first announced by T. H. Wickenden, vice president International Nickel Co. at the American Foundrymen's Society convention in Philadelphia, May, 1948. At present there are about 60 licensees in the United States and about 40 outside this country.

Some of the reasons why industries are beginning to use this material for a portion of their casting requirements are: It provides high yield and tensile strength, offers high resistivity to heat, has good physical properties and may be cast in intricate shapes.

The speaker stated that ductile iron had been poured every day at the Sacks-Barlow Foundry since February, 1950, and that work has been done on melting in a basic lined cupola. Advantages sought are that the melt will be low in sulphur and that carbon pick-up will be greater than in the conventional acid-lined cupola. These factors would be of great benefit in producing ductile iron and basic lined cupolas undoubtedly will be in common use in the not too distant future.—*John Bing, Metropolitan Refractories Corp.*

Connecticut Non-Ferrous

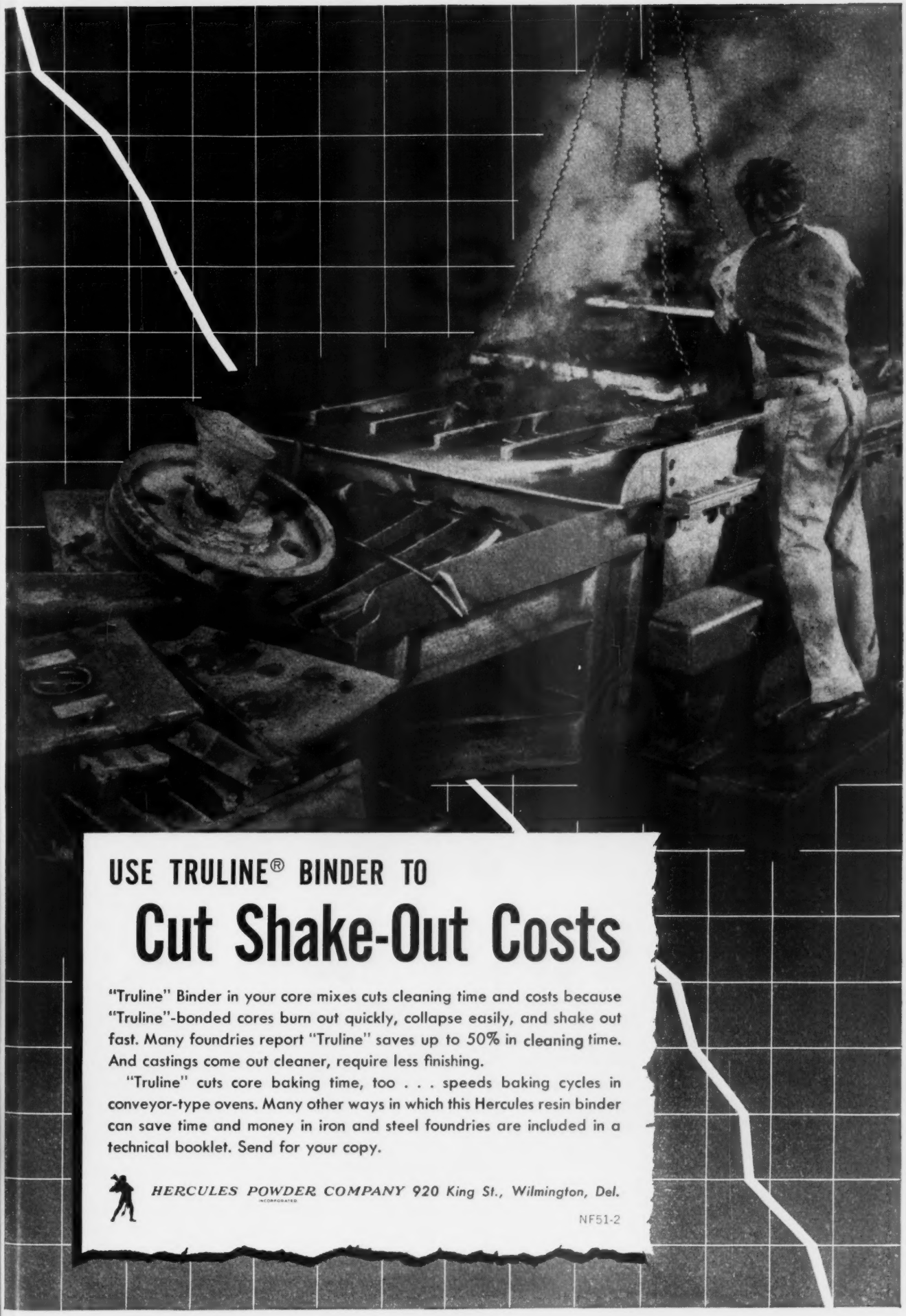
CONNECTICUT Nonferrous Foundrymen's Association elected officers on Dec. 20 as follows: President, Owen Johnson, H. B. Ives Co., New Haven, Conn.; vice president, Stafford W. Chappell Jr., Electric Boat Co., Groton, Conn.; treasurer, Chester Witters, Aluminum Co. of America, Bridgeport, Conn.; secretary, Louis G. Tarantino, Niagara Falls Smelting & Refining Division, Continental Copper & Steel Industries, New Haven, Conn.; technical secretary, John V. McCarthy, Federated Metals Division, American Smelting & Refining Co., Hartford, Conn.

Those elected to the executive committee are: Chairman, T. Joseph Judge, Jenkin Bros., Bridgeport, Conn.; J. Joseph Shannon, Jenkins Bros.; S. W. Chappell Sr., New London, Conn.; D. W. Case, Belknap Mfg. Co., Bridgeport, Conn.; and W. J. Kenney, Knapp Foundry Co., Guilford, Conn.

Speaker was W. G. Reichert, president, Push-Button Foundry Equipment Division, W. G. Reichert Engineering Co., Newark, N. J., who talked on "Foundry Management Looks Ahead with Push-Button Control." As part of his talk, Mr. Reichert exhibited a film showing just such an automatic molding machine in operation, sequence of operations included molding, pouring and shake-

(*Continued on page* 180)

WESTERN NEW YORK Chapter of the AFS held its stag party Jan. 19 at Troop I Post, American Legion. Partial view of the group of 325 is shown above. Photo by Marve Taublieb, Frederic B. Stevens Inc., Buffalo



USE TRULINE® BINDER TO

Cut Shake-Out Costs

"Truline" Binder in your core mixes cuts cleaning time and costs because "Truline"-bonded cores burn out quickly, collapse easily, and shake out fast. Many foundries report "Truline" saves up to 50% in cleaning time. And castings come out cleaner, require less finishing.

"Truline" cuts core baking time, too . . . speeds baking cycles in conveyor-type ovens. Many other ways in which this Hercules resin binder can save time and money in iron and steel foundries are included in a technical booklet. Send for your copy.

HERCULES POWDER COMPANY INCORPORATED 920 King St., Wilmington, Del.

NF51-2

TRI-STATE Chapter of the AFS met on Jan. 12 at Poohlahna Hill Country Club, Tulsa, Okla. At the speakers' table, left to right, are: L. C. Farquhar, American Steel Foundries, East St. Louis, Ill., and national AFS director; F. E. Fogg, Acme Foundry & Machine Co., Coffeyville, Kans., chapter chairman, and Chris A. Zanison, City Pattern Foundry & Machine Co., Detroit, guest speaker

(*Continued from page* 178)

out. As a flask entered the line it moved forward to be indexed over the pattern. The pattern carriage then moved with the flask over to receive sand and to be rammed. The pattern carriage then dropped down and back to its original indexing position while the flask moved on to meet its complementary half coming from a similar operation. The cope half was automatically rolled over and fitted to the drag and the completed mold sent on its way to the pouring station. Several molds were poured at once at this station from nose-tilting ladles with skimmer heads for removing impurities and controlled by push buttons by one of the few men needed to operate the entire setup. After pouring, the molds moved automatically to the shakeout where the sand was sent back to the conditioning unit, the flask to the molding line and the castings to a traveling belt leading to the airless blast cleaning unit. From there the castings moved by traveling belt to the cut off and grinding room. The gates and risers were shuttled back to the melting room and the valve parts on to inspection and assembly.

CENTRAL INDIANA Chapter of the AFS met Dec. 4 to hear a talk by C. O. Burgess, technical director, Gray Iron Founders' Society, Cleveland, shown at right above. At left is Elmer Braun, Central Foundry Division, General Motors Corp., Danville, Ill., who was technical chairman at the meeting

The machine illustrated was said t be capable of turning out 200 mold an hour under normal operatin speed.—*Louis G. Tarantino, Niagar Falls Smelting & Refining Divisio and John V. McCarthy, Federate Metals Division*

Tri-State

FIFTY members and guests of Tri-State Chapter of the AFS were present at the Jan. 12 meeting held at Poohlahna Hill Country Club, Tulsa, Okla. Special guest at the meeting was L. C. Farquhar, American Steel Foundries, East St. Louis, Ill., a national director of the AFS. Chris A. Zanison, City Pattern Foundry & Machine Co., Detroit, was featured speaker. Mr. Farquhar reported briefly on the AFS building fund program. The technical discussion was devoted to a consideration of the shell molding process.—*F. E. Fogg, Acme Foundry & Machine Co.*

Central Indiana

EIGHTY-SEVEN members and guests of Central Indiana Chapter of the AFS heard R. L. McIlvaine, vice president, National Engineering Co., Chicago, on Jan. 8 talk on "What To Look for When Buying a Mechanized System and How To Get the Most Out of It." B. E. Gavin, National Malleable & Steel Castings Co., Indianapolis, was technical chairman.

Mr. McIlvaine stated that the only purpose of a mechanized system is to get more good castings per molding station. The items to look for are: A system that delivers uniform sand to the stations; adequate storage to meet peak demands; some method of cooling sand before it reaches the bin; removal of sand from belt by apportioning method. The only way to get the most out of a system is for it to function properly all the time. To do this, a system must be serviced properly and regularly.—*Paul V. Faulk, Electric Steel Castings Co.*

Tennessee

SPEAKER at the Dec. 1 meeting of Tennessee Chapter of the AFS was James H. Smith, general manager, Central Foundry Division, General Motors Corp., Saginaw, Mich., whose subject was, "The Future of the Foundry Industry." Meeting was held at Hotel Patten, Chattanooga, Tenn.

Mr. Smith pointed out the foundry industry is well aware that it is losing considerable business to other materials such as forgings, stampings, steel weldments, etc. Why do

(*Continued on page* 182)

with UNIVERSAL flask pins, bushings and closing pins

No sighting is necessary to get perfect cope and drag alignment when you use Universal Flask Pins, Bushings and Closing Pins. No time is wasted. Lifting and setting *in one smooth operation* does the job with Cope Pins quickly guided to Drag Pins over tapered loose-fitting Closing Pins which are quickly removed without effort. The Elongated Flask Bushing is specially designed to permit longitudinal expansion to compensate for metal heat *without affecting accurate alignment.* Available for immediate delivery in standard sizes—special sizes and types to order. Direct your inquiries and orders to the office nearest you—1060 Broad St., Newark, N.J., and 5035 Sixth Ave., Kenosha, Wisconsin—or write to our home office.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 4, MICHIGAN

TENNESSEE Chapter of the AFS met at Hotel Patten, Chattanooga, Tenn., Dec. 1 to hear James H. Smith, Central Foundry Division, General Motors Corp., Saginaw, Mich., discuss "The Future of the Foundry Industry." Shown at the meeting, left to right, are: Howard Wilson, Tink Johnson, E. L. Davenport and Frank Hoffman, all of Somerville Iron Works, Chattanooga

(*Continued from page* 180)

we find ourselves in this position? According to the speaker, during World War II the industry suffered a high loss of technical and supervisory personnel to the armed forces and other industries, much of which has not been recovered. Also, costs have been increased through higher wages without a higher corresponding increase in production. In addition, quality of basic materials have been poor and have tended to increase costs. Mr. Smith recalled that back around 1941 it was possible to produce iron at the spout for less than $20 a ton. Today he estimated $50 would be a low figure.

Until about a year ago, high demand for castings made it possible for foundries to choose pretty much what they wanted to make. Since selling prices were high in many instances the foundries had not concentrated to a sufficient extent on cost reductions. In addition, customers were more tolerant in inspection standards, which in some instances resulted in a poorer quality product. At the same time producers of competitive materials were aggressive through carefully planned promotional and educational programs in promoting use of their products.

Mr. Smith considered ways and means of overcoming to some degree the industry's common problem. The following must be given top priority: Use and development of more modern equipment; cost reductions; greatly improved inspection methods; a new and better sales approach; higher caliber and better trained organizations; a tremendously improved product at a lower cost. The speaker discussed each of these recommendations in detail. (FOUNDRY, April 1949)

—*Carl A. Fischer, Fischer Supply Co.*

CHICAGO Chapter of the AFS held roundtable sessions at its Jan. 9 meeting. At top is a view of the Steel and Pattern Division group who heard A. S. Grot, Edward Valves Inc., East Chicago, Ind., speak. Center group participated in a discussion of foundry headaches. The Gray Iron Division group is shown at bottom. Oscar Blom, Curto-Ligonier Foundry Co., Ligonier, Ind., spoke. Photos By I. H. Dennen, Beardsley & Piper Division, Pettibone Mulliken Corp.

Chicago

WHAT the foundry industry has ahead of it in the way of order volume, controls, regulations, materials supply, manpower, and the like, was the subject on which Chicago Chapter of the AFS, focused attention at its Feb. 5 meeting at the Chicago Bar Association. Speaker was Frank G. Steinebach, editor of FOUNDRY.

Chapter President Chester V. Nass, vice president, Pettibone Mulliken Corp., Chicago, presided over the meeting which was attended by about 130. Reporting that the annual Ladies' Night party at the Palmer House, Feb. 3, attracted more than 500 members and their guests, Mr. Nass declared the event a gratifying success and complimented the entertainment committee for the achievement. In particular, he commended the chairman, Robert M. Jones, foundry superintendent, South Works, United States Steel Co.; the secretary, Harry E. Cullen, director of recreation, also United States Steel Co.; and S. E. McGinty, president, Firegan Sales Co.

Frank B. Hall, administrative engineer, Beardsley & Piper Division, Pettibone Mulliken Corp., provided a lighter touch to the meeting. Through his proficiency with magic and its special application to foundry practice, he demonstrated some new materials and techniques which guarantee perfect castings 100 per cent of the time. Of particular interest to the audience was a new synthetic sand called "Transformite." Specific details were withheld beyond the fact that it consists of specified proportions of anti rat-tail powder, sag prevention powder, a binder, and a blowhole eliminator. Mr. Hall's demon-

(*Continued on page* 184)

THIS MONTH, 62,562* BUYERS OF CASTINGS WILL READ THIS AD...

This is one of a series of 6 full page ads emphasizing the expanding industrial acceptance of Brass Castings. Nationally circulated in outstanding trade journals and read by manufacturers, engineers, contractors, metallurgists, production control men—*these messages reach the men who specify and influence the purchasing of castings!*

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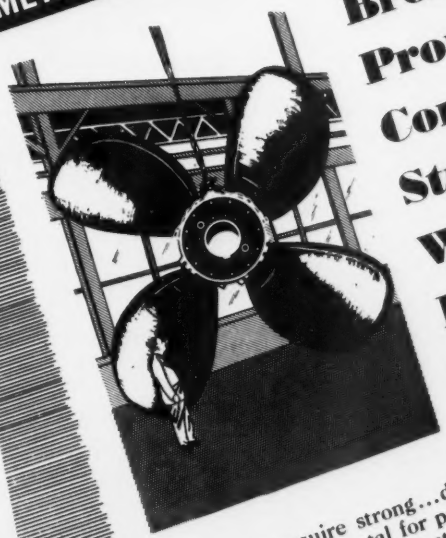
METALLURGICAL RESEARCH HAS PROVEN

Manganese Bronze Propellers Combine Strength With Resistance To Sea Water Corrosion



Shipbuilders require strong...ductile.. corrosion resistant metal for propellers. Foundrymen insist upon metal having suitable running qualities...low pouring temperatures and not readily susceptible to gas porosity.

Manganese Bronze is the only metal that meets the requirements of both shipbuilder and foundryman.

Tensile strength and degree of elongation can be varied according to the need. Yes, these high tensile properties are obtained in the "as cast" condition—without heat treatment.

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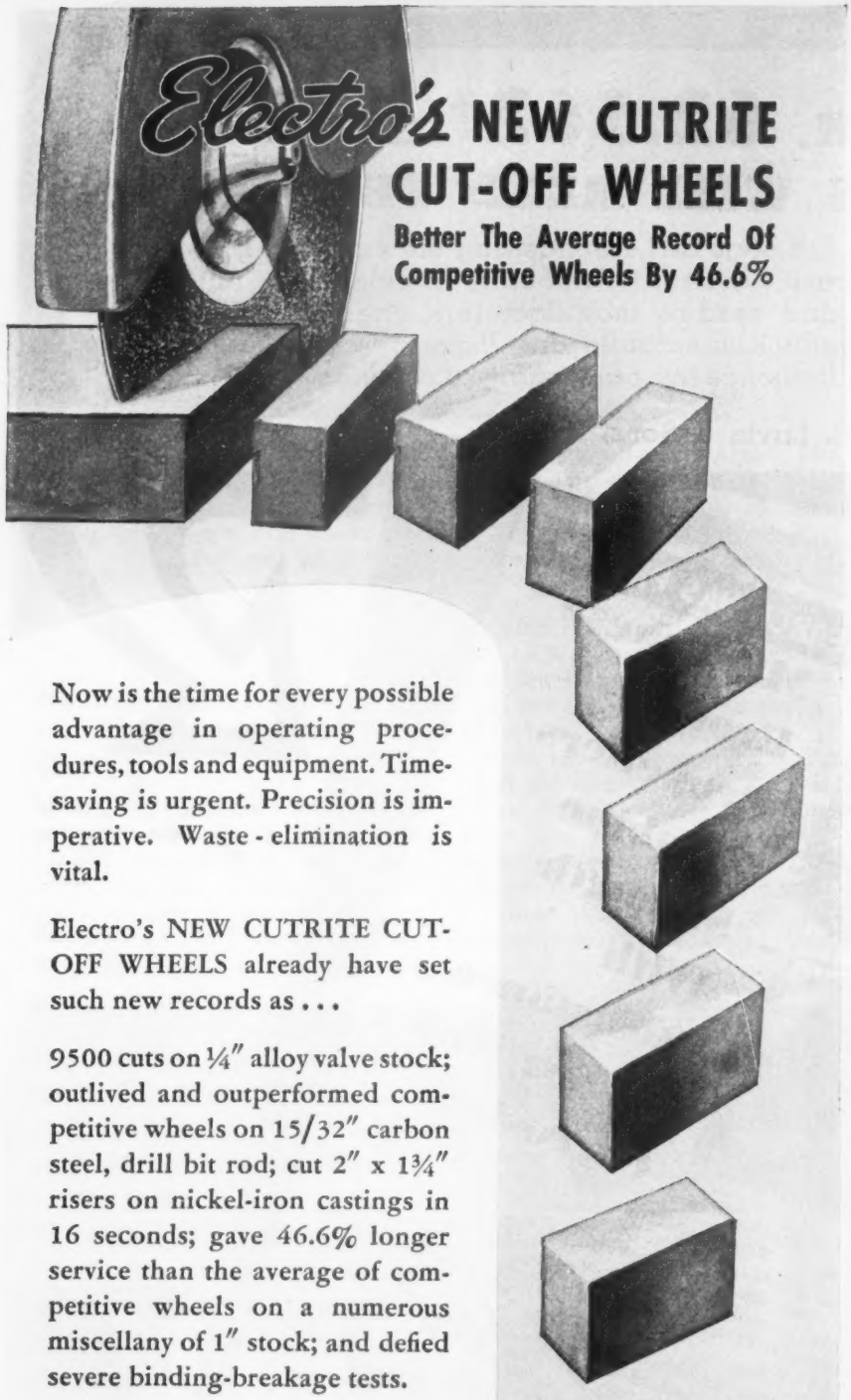
REPRESENTATIVES IN PRINCIPAL CITIES

The Foundryman's Problems . . . Are Our Problems!

REPRINTS OF ENTIRE *Brass Castings* SERIES ARE YOURS FOR THE ASKING

* Audited Circulation plus pass-on readership.



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Better The Average Record Of Competitive Wheels By 46.6%

Now is the time for every possible advantage in operating procedures, tools and equipment. Time-saving is urgent. Precision is imperative. Waste - elimination is vital.

Electro's NEW CUTRITE CUT-OFF WHEELS already have set such new records as . . .

9500 cuts on ¼" alloy valve stock; outlived and outperformed competitive wheels on 15/32" carbon steel, drill bit rod; cut 2" x 1¾" risers on nickel-iron castings in 16 seconds; gave 46.6% longer service than the average of competitive wheels on a numerous miscellany of 1" stock; and defied severe binding-breakage tests.

Write, wire or *phone* for a competent Field Engineer to prove these new wheels on *your* jobs. Also, if you need it, to help with problems of rough grinding like snagging and precision work like roll grinding.

HIGH-SPEED GRINDING WHEELS • CRUCIBLES • REFRACTORIES • SiC Electro-Carb BRIQUETS • STOPPER HEADS•POROUS MEDIA • Electro-Carb (SiC) ABRASIVE GRAIN, GRITS

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344 DELAWARE AVENUE • BUFFALO 2, NEW YORK
West Coast Warehouse . . . Los Angeles • Canadian Electric Furnace Plant, P. Q.

(*Continued from page* 182)

strations were conclusive as to end results to be obtained.

In introducing his comments, Mr. Steinebach reviewed the situation in the castings industry in World War II and told how steps are being taken to avoid former pitfalls in the current defense program. He explained the activities and co-ordination of the National Castings Council and the Foundry Industry Advisory Committee to the Munitions Board.

Among topics which the speaker thumbprinted were: Unfilled orders mounting but production keeping up; cast steel armor plate requirements; stockpiling of critical materials during period of heavy demand; merchant blast furnaces not keeping up with growth of the foundry industry; coke is more scarce than pig iron; shortage of alloys; inadequacy of manpower; danger of sabotage; tempo of controls increasing; a CMP a certainty; and expansion of steel castings capacity a necessity.—*Erle F. Ross.*

Metropolitan Brass Founders

METROPOLITAN Brass Founders' Association, recently elected the following officers: President, Eugene Fiammi, World Brass Foundry, Brooklyn, N. Y.; vice president, Joseph Morrison, Burndy Engineering Co., Bronx N. Y.; secretary-treasurer, Raymond E. Bietry, B & S Bronze Foundry Inc., Brooklyn; and executive secretary, George Staub, Whitestone, N. Y.

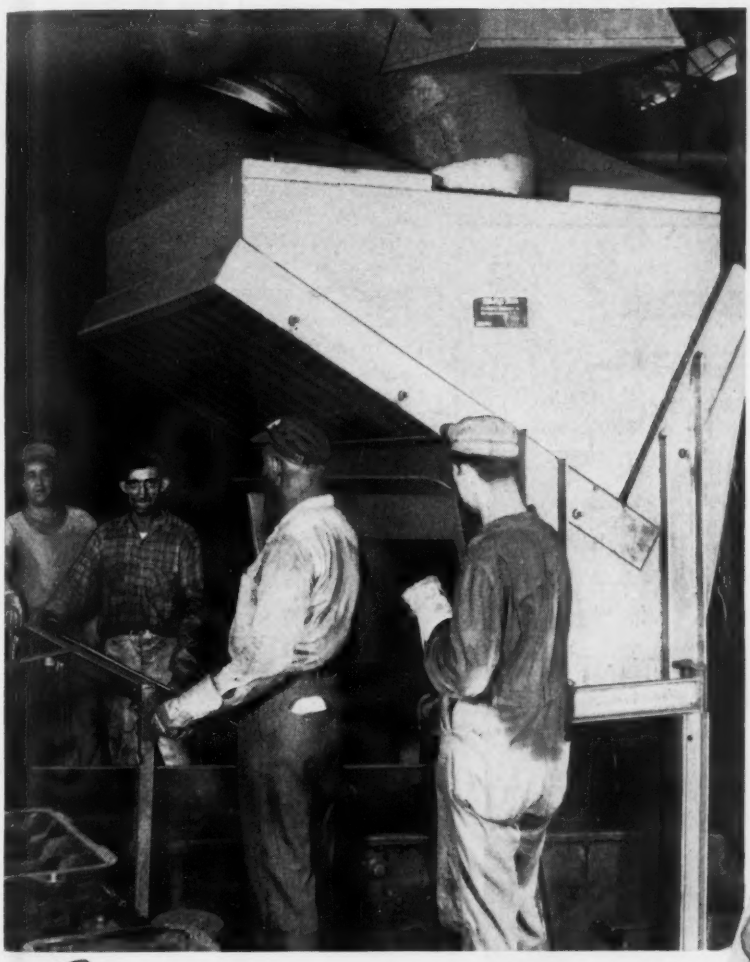
A talk on "Bronze Melting and Casting Problems" was given by Robert A. Colton, research metal-

(*Continued on page* 186)

CENTRAL OHIO Chapter of the AFS heard Dr. L. W. Eastwood, Battelle Memorial Institute, Columbus, O., deliver the commentary with the film, "Metal Flow in Molds," Jan. 8. Photo by courtesy of W. H. White, Jackson Iron & Steel Co.

REDUCE EXHAUST AIR WITH CONTROLLED VENTILATION

Balanced Air Supply Saves Money



Lavish use of exhaust air can be expensive. When excessive volumes are used an unbalanced condition results in the foundry, setting up unwanted air flow patterns and causing waste of needed plant air.

Schneible "Compensating Air" hoods are designed with controls that allow the proper volume of supply air from either inside in summer to remove hot, dead air from under the roof, or outside in winter to conserve wanted power plant heat. Exhaust air volumes are also regulated to maintain building ventilation balance and more efficient use of all air.

Your local Schneible engineer has detailed information that will enable you to cut ventilation waste and save money—or write direct to

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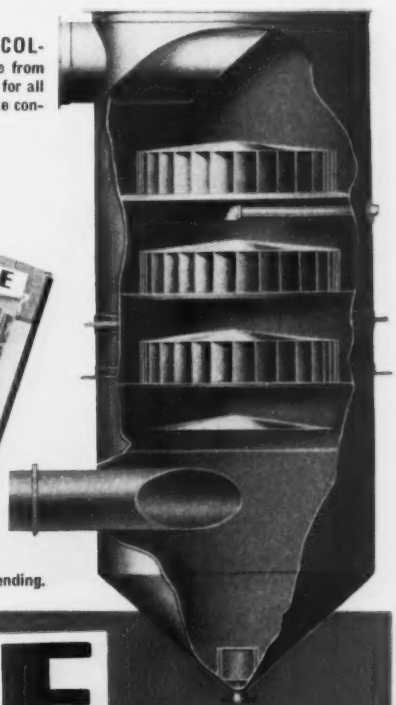
MULTI-WASH COLLECTORS available from 1000 to 36,000 c.f.m. for all dust, fume and smoke control applications.



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BULLETIN NO. 450

The latest information on standardized Schneible Uni-flo Hoods for Shakeouts, Pouring Stations and Mold Conveyors is now available for your files.

This comprehensive 16-page two color catalog includes pictures of each type of hood, tells how it functions and its outstanding features.

U. S. and Foreign Patents Pending.

SCHNEIBLE

(*Continued from page* 184)
lurgist, Federated Metals Division, American Smelting & Refining Co. Those present kept him answering questions for two hours.

The entertainment committee announced plans for an entertainment and dance to be held Apr. 6 at Hotel New Yorker.

Northwestern Pennsylvania

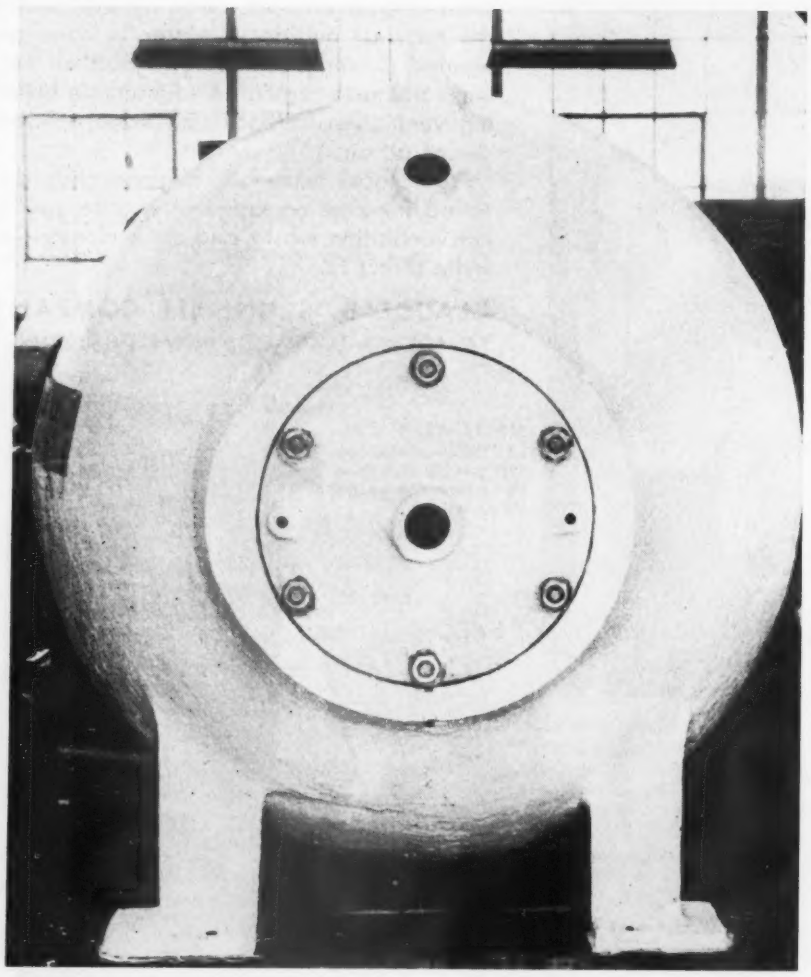
APPROXIMATELY 100 members of Northwestern Pennsylvania Chapter of the AFS were present at the Jan. 22 meeting held at the Erie Moose Club, Erie, Pa. Speaker was Thomas E. Eagan, chief metallurgist, Cooper-Bessemer Co., Grove City, Pa., and a national dircetor of the AFS. His subject was "Engineering Properties of Gray Iron for Foundrymen."

Mr. Eagan stated there is a field open to the gray iron industry today that includes most any type of job. If properly controlled in the foundry, gray iron of different structures can be made to suit the requirements of the job it is to do. He believes today's foundryman should be an engineer and offer suggestions to the designer so that good castings can be made with low scrap losses in the foundry. Care must also be taken in the selection of metals for the melt so that the scrap used has no impurities which will prove detrimental to the casting.

Earl Strick, Erie Malleable Iron Co., Erie, and secretary of the chapter, presided at the meeting. Fred Eisert, Urick Foundry, Erie, Pa., acted as discussion leader.

The chapter's holiday party was held Jan. 12 at Siebenberger's Singing Society Club Rooms in Erie, with 250 members and guests in attendance. Following dinner and refreshments, more than 100 door prizes were distributed and an entertaining floor show was presented by a group.

Harold Lolley, foundry superintendent, Erie Plant, Bucyrus-Erie Co., was chairman and was assisted by the following committee members: Jacob Diemert, Erie Castings Co.; William Piper, Erie Bronze Co.; Clyde Cooper, Keystone Brass; William Miller, Frederic B. Stevens Co., and Fred Carlson, Weil-McLain Co. Chapter chairman, Frank Volgstadt, extended his thanks to the committee for a job well done.—*Earl M. Strick, Erie Malleable Iron Co.*



BENTHOSCOPE, in which Otis Barton, Boston scientist, has undertaken mile-deep undersea explorations in Pacific waters off La Jolla, Calif., was made by Atlas Steel Casting Co., Buffalo. The cast steel ball, weighing 5400 lb without equipment installations, is designed to withstand pressures beyond 3000 psi with assured safety at depths of 6000 ft and theoretical safety factors to 10,000 ft. Photo courtesy Steel Founders' Society of America, Cleveland

Cleveland Non-Ferrous

CLEVELAND Chapter of the Non-Ferrous Founders' Society met at the Cleveland Athletic Club Jan. 25 to discuss Department of Commerce regulations concerning the nonferrous industry. Principal speaker was Glenn W. Thompson of the Cleveland office, Department of Commerce.

Mr. Thompson stated that one of the purposes of current regulations is to curtail civilian production to a point where defense needs can be met. However, he added that governmental policy is to favor increased production so that defense orders can be filled and the need for civilian products met also.

Mr. Thompson devoted a major portion of his time to answering questions regarding various forms which must be submitted to the government by firms seeking relief from hardship worked by the regulations. Most questions requiring interpretation of the regulations drew "if-but" answers from Mr. Thompson, who stated that many provisions of the regulations were being changed.

W. A. Gluntz, Gluntz Brass & Aluminum Foundry Co., Cleveland, and a national director of the society, reported on activities of the national society in setting up industry committees to work with the government.—*Robert H. Herrmann.*

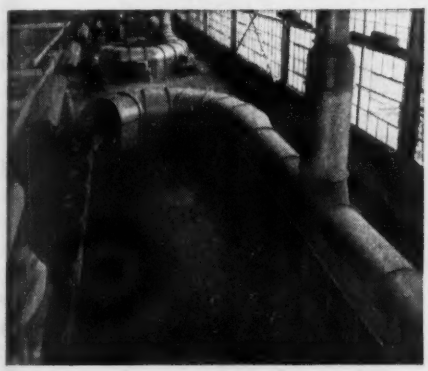
Southern California

AT the Jan. 12 meeting of Southern California Chapter of the AFS, held at the Rodger Young Auditorium in Los Angeles, principal speaker was Kennard F. Lange, sales manager, Link-Belt Co., Chicago, whose subject was, "Mechanizing of Small Foundries."

Mr. Lange listed the following reasons why management decides to mechanize its foundry: To obtain lower costs, to increase production, to conserve manpower and space, and

(*Concluded on page* 188)

Above: **Bartlett-Snow "Dust-Sucker" Side-Wall Hoods at Pouring Station of Large Production Foundry.**



Smoke Hoods Over Mold Conveyors Prevent Contamination of the Air, and Cool the Castings.

Bartlett-Snow "Dust-Sucker" Side-Wall Hood at Shakeout Handling Large, Heavy, Dry Flasks.

Smoke Control

pays big dividends

● Bartlett-Snow side-wall pouring hoods — smoke hoods for mold conveyors — and side-wall or canopy hoods for shakeouts, prevent smoke and choking fumes from clouding and contaminating the foundry air, save electric light, and make foundries better, cleaner places in which to work.

Clean foundries attract a higher, more desirable type of workman. Sickness and absenteeism are much reduced, resulting in increased and more uniform production, lower casting costs and greater profits. Complete facilities to meet every requirement. The C. O. Bartlett & Snow Company, 6201 Harvard Avenue, Cleveland 5, Ohio.

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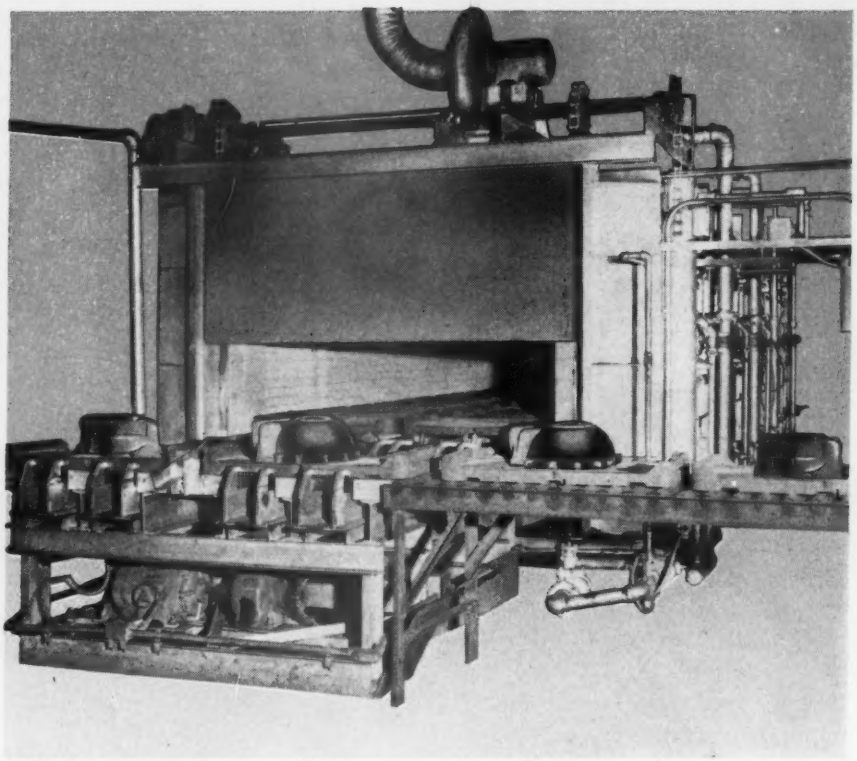
BARTLETT-SNOW
CLEVELAND 5, OHIO

FABRICATORS ERECTORS



This Holcroft annealing furnace

Controls Oxidation

of gray iron castings

The twin jobs of controlling the surface appearance and annealing gray iron castings are efficiently carried out by this new Holcroft furnace.

An adjustable combustion system uniformly produces the hard, blue scale preferred by most manufacturers. Castings look better and resist rust.

The furnace anneals 6000 lbs. of castings each hour while maintaining constant physical properties. Work is brought up to 1100° F in 2⅔ hours and is held at that point for another 2½ hours. Castings are then cooled at a uniform rate to 800° F for 1½ hours.

To help keep costs down, material handling is held to a minimum. Castings are conveyed through the furnace on trays and are unloaded by a tip-over device.

Foundries are finding that Holcroft furnaces save time and cut costs. Want more information? Write today!

Blazing the heat-treat trail!

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BUILT BY HOLCROFT & COMPANY DETROIT-MICH

PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

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HOUSTON 1 — R. E. McArdle, 5724 Navigation Blvd.
CANADA — Walker Metal Products, Ltd., Windsor, Ontario
EUROPE — S.O.F.I.M., Paris 8, France

(*Concluded from page* 186)

to improve working conditions. Necessity of mechanization has become urgent in many instances since, according to the speaker, between 150 to 200 tons of materials have to be handled to produce one ton of castings.

The speaker stated that foundry management must survey carefully its present facilities to prepare for the imminent production requirements of the armament program which, in many instances, may be added to the present volume of production. Mechanization of sand and molding systems can result in production increases of 50 to 200 per cent.

He pointed out further that mechanization of large production foundries has shown the way to mechanize smaller foundries in which more flexability is required to mold, pour and handle many sizes of castings. It is important that mechanization plans incorporate completely all long term improvement programs, even though intentions are to install units separately from time to time. If it is impossible for the foundry to stand the cost of complete mechanization, Mr. Lange said that standard units can be installed economically.—*S. L. Jackson, Electro Metallurgical Division*

Philadelphia

APPROXIMATELY 150 members and guests were present at the Jan. 12 meeting of Philadelphia Chapter of the AFS. Principal speaker was Bernard H. Ames, senior metallurgist, New York Naval Shipyard, Brooklyn, N. Y., and G. H. Bradshaw, master molder, Philadelphia Naval Base served as technical chairman.

Mr. Ames' topic was "Plastic Bonded Shell Molds," which he supplemented with slides and sample molds.

Frank G. Steinebach, editor of FOUNDRY, stated that foundries of the United States would be called upon for an all-out production performance to meet this new national emergency.—*G. H. Bradshaw, Philadelphia Naval Shipyard*

Old Timers Are Honored

Wrist watches were presented recently to five employees of Federal Foundry Supply Co., Cleveland, in recognition of more than 25 years that each had served. Ralph Ditty, company president, congratulated the following for their faithful service: Dora Redecker, 36 years; Frank Suran, 30 years; George Donoghue, Sr., 27 years; James Hasman, Sr., 26 years; and William Alznauer, 25 years.

Flask Equipped with ¾" Square Pins.
Several Types Of Pins To Choose From

50%

Increase in production is reported by a large midwest producer of Lawn mower castings, after installing "Diamond Featherweight magnesium flasks".

50% more molds per floor with less fatigue to the molder was attained.

Strong and light in weight, The Diamond Featherweight is the fastest and easiest operated flask on the market.

Fast operating sand strip releases flask with ease from the mold.

No clogging with sand, and no sand hanging in the corners.

The ideal production flask for all foundries.

We also manufacture a complete line of Wood Flasks, both snap and slip. Steel and Aluminum Jackets, steel and aluminum core plates, steel and aluminum bottom boards.

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Telephone 2-2553 **CLAMP AND FLASK COMPANY** **Richmond, Indiana**

Designers of* CORE PLATES, JACKETS, BANDS, FLASKS *since 1889

By THOMAS A. DICKINSON

Casting Tools for Molding Nonmetallic Materials

SINCE the end of World War II, high operating costs in virtually all industries have evolved a steadily growing demand for less expensive tooling for the molding of plastics, rubber, leather and similar materials in small or moderately large quantities.

Classical methods of machining or hobbing tool steels were adequate for the fabrication of long-lived molds to meet the requirements of mass-production markets, but there was no need for mass-production tooling in the manufacture of many saleable products.

Demand for low-cost tooling has been especially great in the western states, where small industries predominate. While many new types of tooling have been developed experimentally for western manufacturers, metal molds—made with more or less standard foundry casting facilities—are now meeting a majority of the production requirements.

Generally, the techniques involved in casting metal production molds or dies are the same as processes used to cast other metal products for many years. However, a number of specific procedural variations have been developed to increase both the quality and quantity of the tooling that could be cast.

Patterns—Patterns are made from most conventional materials. Foundry facilities are normally used to make patterns from accurate mockups or models by these methods:

1. Splash-casting plaster or plastic compounds to produce requisite cavity patterns on the mockups or models.

2. Hand-pressing heat-softened thermoplastics over various surfaces of the mockups or models, so that the materials will cool and solidify as cavity patterns.

3. Making a flexible mold on a mockup or model, so that duplicate models can be cast for use in making patterns for multi-cavity metal molds.

4. Masking a model so that a metal cavity pattern can be produced as a metallized "strip coating" thereon, after which the pattern may be used like a plaster pattern or imbedded in sand so that it can be reinforced with cast alloys to serve as part of the finished tool.

5. Casting wax, thermoplastics, or low-melt alloys to produce investment patterns on mockups or models.

If a mockup or model is dimensionally accurate, shrinkage can usually be computed in accordance with the properties of a pattern material and the alloy which will be used for casting purposes. However, it is sometimes desirable to make further allowances for "after shrinkage" or similar phenomena which characterize plastics and other materials which may be molded with cast-alloy tooling.

A 1/16-in. draft allowance is usually made on the pattern for a finish on each side or end of a casting; also, on the face unless the casting has an irregular parting line.

No allowance is normally made for machining a force along its parting line, although a small bead may be produced for machining purposes around the edges of a cavity with an irregular parting line.

In many circumstances, it is desirable to use "master patterns" comprising refractory-type plasters, since these can be provided with metal retaining forms for use as molds in which several duplicate castings can be produced. The retaining forms or frames may have any shape required to fit snugly around the pattern edges, and each should be made from steel sheet or plate so that it will be rigid when castings are made yet easy to disassemble after castings solidify.

Height of a pattern frame should be at least 3/16-in. greater than the height of the casting to be made, so that the casting can be cut and machined accurately at its base. Frame walls are of uniform thicknesses, ranging up to about ½-in. as a rule, and may be reinforced to resist forces created by on-center centrifugal casting.

Where pattern-frame molds are

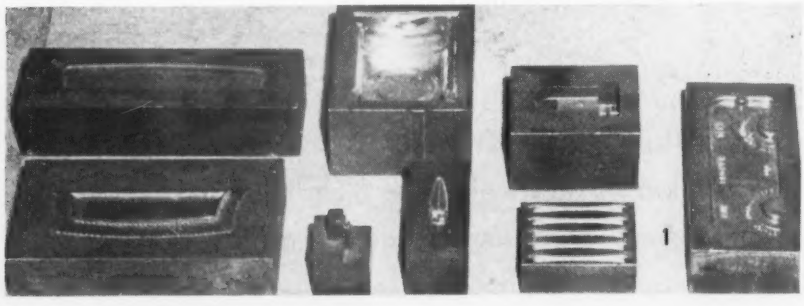

Fig. 1—Typical metal molds cast from high-strength alloys

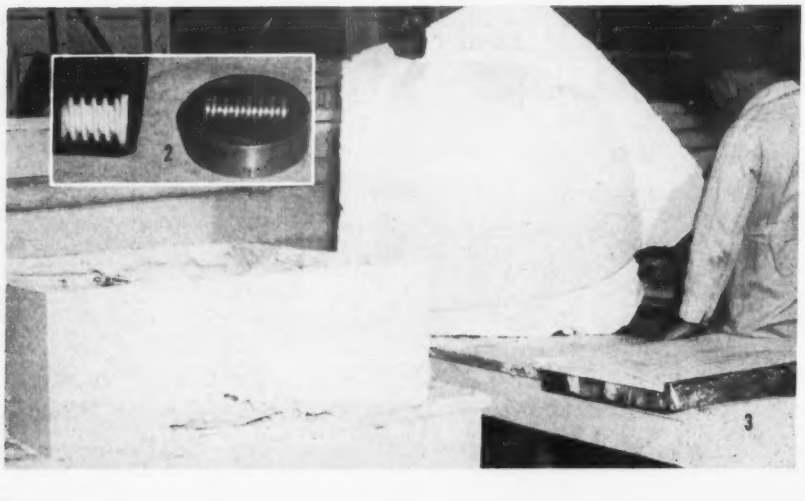

Fig. 2 — Pressure-cast beryllium-copper mold at right was made from pattern shown at left

Fig. 3—Inexpensive patterns for casting production molds frequently are made from plaster

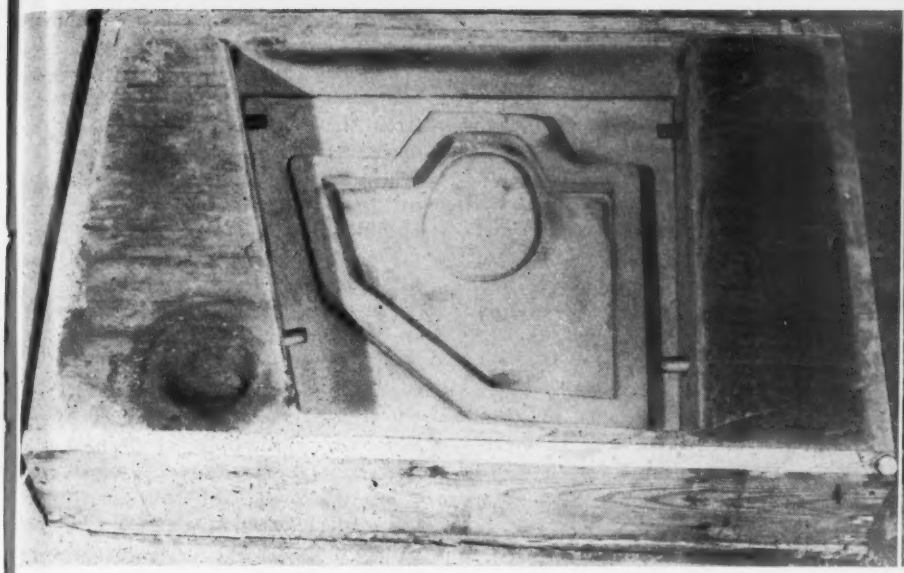

Fig. 4—Open-type sand mold of type commonly used to cast metal molds.
Fig. 5—Finishing cavity of sand-cast production mold made of aluminum-zinc alloy at Stainless Steel Products Inc., Burbank, Calif.

utilized, it is frequently possible to avoid the fabrication of matchplate patterns by casting a sequence of identical cavities. The latter can later be welded or otherwise assembled to provide a multicavity mold for production work.

Mold—Both green and dry sand molds have been successfully used to make short-run production tooling and fairly long-lived cavities for production work that did not require the use of high molding temperatures or pressures (e.g., in laminating glass-fiber materials with clear or pigmented polyester resins). However, other types of molds are preferable when tooling must be cast for optimum strength and durability since it is possible to attain the most desirable granular structure in cast alloys by:

1. Maintaining the cast metals in a molten condition long enough to permit the effective use of on-center centrifugal forces, as heretofore suggested.

2. Casting the alloys in investment molds via an off-center centrifuge.

3. Withdrawing air through the pores of a plaster mold by a vacuum attachment.

4. Applying mechanical, pneumatic or hydraulic pressure in comparatively low increments to metal castings during solidification.

Of these methods, the first seems to be most practical for molds of all sizes. However, all of the remaining three techniques have been used with considerable success by various foundries in different circumstances and varying shop conditions.

The metal molds may be cored for many functional purposes (e.g., to provide a means of using steam heat to solidify thermosetting plastics and rubber). However, it is rarely desirable to reduce the weight of the mold by use of cores; in many circumstances it is preferable to produce small openings by machining the solidified casting.

Specific rules adopted for coring molds for stainless steel tooling casts are at least typical of the rules that should be observed in making all types of cast-alloy molds and may be summarized as follows:

1. If the casting is no more than ½-in. thick and 4 in. square, and if the cavity is no more than ¼-in. deep, a casting should be produced without back coring.

2. If the casting is about ½-in. thick and should have corresponding forces cored from the back to provide a uniform wall, the back coring may be ribbed on 1-in. centers, and a 5-degree draft should be allowed for the coring on one side and on all surfaces.

3. If the casting has a normal or deep cavity and a more or less uniform wall (½-in. maximum) on all side and bottom areas, the bottom should not be cored out, although the corresponding force should be cored and ribbed from the back.

4. If the casting has a spherical or cylindrical cavity shape, back coring should be used and forces (being self-supporting) need not be cross ribbed.

5. If a cavity has one or two open ends, the casting may be made with a temporary wall at each open end and the wall may be cut off after casting; or, if dimensional specifications permit, two or more open-end cavities may be cast end-to-end and later separated by cutting.

6. If the parting lines of a cavity must be irregular, the casting should be back-cored and cross-ribbed on 1-in. centers.

7. If the length of a force must be greater than the product of the length and diameter of a casting, the force should have a hole through its small end to provide a support for back coring.

The "forces" mentioned in the foregoing rules are machine-mold constituents whose purpose in each circumstance is to enter a cavity block so as to exert pressure on a molding compound.

Alloys—Virtually all castable metals may be regarded as potential alloys for industrial tooling castings. However, the selection in each case can usually be determined in conformity with one or more of the following qualifications:

1. Where low cost alone is the most important requirement, alloys such as antimonial lead can be cast and finished with optimum ease due to their comparatively low melting temperatures, softness, etc.

2. Where a combination of light weight and durability is essential, aluminum-alloy castings can be easily handled and will meet most molding temperature - pressure requirements without greatly exceeding the cost of low-melt alloy molds.

3. Where molds should yield products of maximum smoothness or with-

out a loss of small details during rather long production runs, stainless steel and beryllium-copper alloys both have good casting characteristics plus high resistance to wear and corrosion. Stainless steel tooling usually will have the most mechanical strength; but beryllium copper offers low porosity, a comparative lack of brittleness, and exceptional resistance to wear and corrosive chemicals (such as the acids and solvents frequently compounded in inorganic molding materials).

4. Where maximum productivity is the principal tooling requirement, molds made with "super-steel" alloys may be essentially as good as hobbed-steel cavities. However, molds made with "super-steels" are normally regarded as most practical for die casting—where there is a more specific need for high mechanical strength and chemical inertness at elevated temperatures. Less expensive tooling can meet most of the requirements for cast metal cavities in molding rubber, plastics, leather, etc.

Alloys for cast metal tooling are melted and otherwise processed in accordance with conventional foundry practices for optimum homogeneity and minimum grain size; and, whenever possible, it is considered desirable to select materials and processing methods so that resultant molds will exceed maximum production requirements by about 30 per cent.

In many circumstances, mating tools for mold cavities have been cast without the use of separate patterns by using the cavities themselves as casting-mold units. This normally involves facing the cavity unit with a refractory compound (such as a paste made with fireclay) and erecting a flask-like retainer for the cavity, so that alloys can be cast without damaging the cavity to requisite mating-tool dimensions. Tooling thus produced may comprise either identical metals or two different alloys, depending on the circumstances.

Finishing—As-cast production tooling, if not made with "soft" or low-melt alloys, is usually annealed to facilitate finishing operations. Finishing operations include repair of any surface defects, the heat-treatment, if necessary, for maximum physical properties, and buffing, honing, or plating the surfaces so that the latter will be smooth enough for production usage.

The last of these operations is particularly important, because the usefulness of most production molds is directly proportional to the amount of work that must be done to finish the products molded therein.

For example, plastic moldings should acquire a surface smoothness from the cavities in which they are produced so that nothing more than "flash" must be removed before the moldings are ready for use; since machining costs otherwise might increase the price per molding to a prohibitive sum.

All of the castable alloys mentioned can be finished with grinding, polishing or honing equipment for most production-mold purposes. However, the cost of such finishing may be excessive if mirror-smoothness is required; and resultant cavity dimensions might not be within close-tolerance specifications.

Therefore, it is rather common to electroplate the cavities with chromium, cadmium, silver, zinc, or some other metal which can provide a glossy finish with suitable hardness. Such plating can be accurately applied for considerable durability in layers no more than .0003 to .0005 in. thick at a comparatively low cost. In addition to providing an extremely bright finish, the deposition metals will shield a cast-mold cavity so that the latter can be used for more than a predetermined quota of production (worn plating can be removed and replaced for much less than the cost of a new mold).

Conclusion—While cast alloys lack some of the desirable qualities of wrought products, the low cost of cast-metal tooling is an important factor for example, a cast stainless steel mold, 8 x 8 x 10 in., has been used to produce approximately 500,000 leather packings at a total tooling cost of less than 1/17-cent per unit, after which the mold had to be discarded. If comparable work had been done with a machined-steel mold, the tooling cost for a million identical leather packings would have been 1c per unit—at which rate, more than 50 per cent could still have been saved through use of duplicate tool castings. The cost of machined-steel cavities could have been reduced at least 30 per cent through the use of hobbed-steel cavities, but even then more than three million packings would have been required before the use of cast-alloy tooling would have been economically impractical.

Acknowledgment—For much of the data in the foregoing article, the writer is indebted to W. S. Harmon, Process Mold Co.; J. A. Kavanaugh, Standard Tool Co.; W. G. Harvey, Stainless Cavity Corp.; R. H. Osbrink, Osbrink Mfg. Co.; and Adrian Reynolds, Intracast Co.

Photo by Edward J. Solotko, Cleveland Plain Dealer

CAST IRON CIRCUS: Probably the most complete collector's group of cast iron toy circus wagons is that of Wilmer H. Cordes, American Steel & Wire Co., Cleveland. He is shown here with part of his collection. The pieces were made by the Hubley Mfg. Co., Lancaster, Pa., about 1880, and are from Mr. Cordes' extensive collection of various old cast iron toys. His cast iron banks were featured in two articles in *Foundry*, April, May, 1947

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10" Post Type
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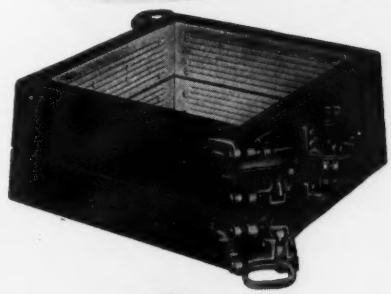
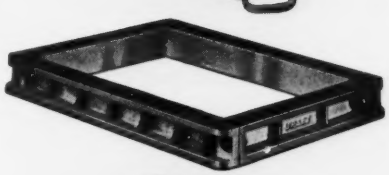
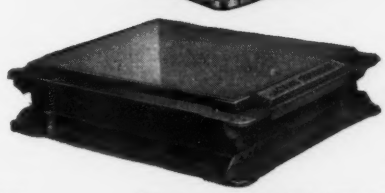
Portable Type







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EQUALLY efficient as jolt-squeeze-pattern-draw machines or plain jolt squeezers, these simply designed production units will reduce production costs and minimize rejects. Their operation is so simple and easy that no special skill is required to maintain uninterrupted high production levels. Available in both post and side rod types, stationary and portable.

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When you use Adams Flask Equipment you are assured the superior performance that means peak production. Adams Cherry Slip Flasks or Cherry Snap Flasks used with Adams Cast Iron, Aluminum or Steel Jackets are a combination hard to beat for accuracy, convenience and economy. Remember — all Adams Flask Equipment is made by experienced craftsmen to your exact specifications.

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Foundry STATISTICS

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1948	933,265	525,212	.....
1949			
Nov.	49,439	25,250	55,795
11 mo.	655,951	341,535	.....
Dec.	57,379	29,679	60,835
Total	713,330	371,214	.....
1950			
Jan.	62,874	32,918	62,307
Feb.	60,386	31,249	67,049
Mar.	66,259	38,639	69,866
Apr.	69,822	36,279	76,250
May	76,161	42,432	77,074
June	82,345	46,613	86,783
July	67,514	37,198	105,300
Aug.	86,021	50,019	132,374
Sept.	82,479	46,927	152,583
Oct.	89,968	50,157	160,278
Nov.	85,163	48,670	180,099
11 mo.	828,992	461,101	.....

Copper-base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1948	1,030,825	930,790	59,009	.....
1949				
Nov.	61,818	56,669	2,811	23,625
11 mo.	660,275	596,153	34,225	.....
Dec.	63,873	58,291	3,086	23,435
Total	725,318	654,444	37,311	.....
1950				
Jan.	65,585	58,878	3,440	25,216
Feb.	67,029	60,257	3,626	26,923
Mar.	80,442	71,876	4,693	27,631
Apr.	72,318	64,773	3,848	28,769
May	79,108	71,605	3,751	30,880
June	83,023	74,990	3,896	32,808
July	69,033	62,414	3,789	39,906
Aug.	94,013	85,948	4,258	52,513
Sept.	95,641	87,111	4,630	58,673
Oct.	105,746	96,911	5,064	66,560
Nov.	103,694	93,607	5,776	67,931
11 mo.	915,632	828,370	46,771	.....

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1948	424,490	139,781	161,334	118,738	.....
1949					
Nov.	26,317	9,212	8,315	8,348	36,846
11 mo.	277,672	96,755	95,194	79,407	.....
Dec.	26,762	10,070	7,714	8,430	36,921
Total	304,616	106,825	102,908	88,019	.....
1950					
Jan.	28,801	9,646	9,400	9,052	40,591
Feb.	28,887	10,171	9,358	8,851	44,235
Mar.	35,845	13,035	11,094	10,870	47,350
Apr.	33,356	11,091	10,656	10,795	49,952
May	36,031	11,526	11,928	11,799	52,580
June	37,600	12,677	11,825	12,173	53,309
July	30,152	9,613	9,808	9,943	63,892
Aug.	39,852	14,117	12,682	12,207	82,564
Sept.	42,061	14,369	13,095	13,594	89,723
Oct.	47,278	15,994	14,893	15,408	102,938
Nov	46,816	16,099	14,040	15,715	67,931
11 mo.	406,679	138,338	128,769	130,407	.....

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1948	8,214	7,488	....
1949			
Nov.	801	769	2,399
11 mo.	8,583	8,043	....
Dec.	781	738	2,216
Total	9,364	8,781	....
1950			
Jan.	814	762	2,237
Feb.	735	676	2,218
Mar.	903	849	2,322
Apr.	799	751	2,305
May	810	762	2,282
June	758	698	2,482
July	727	677	3,356
Aug.	1,147	1,078	4,855
Sept.	1,231	1,154	4,942
Oct.	1,354	1,297	5,573
Nov.	1,508	1,434	6,928
11 mo.	10,786	10,138	....

Foundry Production Workers

Estimated Number

	Oct. 1950	Sept. 1950	Oct. 1949
Iron & Steel	226,800	221,900	171,600
Nonferrous	89,500	85,400	64,100

Average Weekly Earnings

Gray Iron	$70.76	$68.19	$56.18
Malleable Iron	70.18	68.55	52.32
Steel	69.63	66.00	56.12
Nonferrous	72.29	70.45	62.21

Average Weekly Hours

Gray Iron	44.5	43.6	38.4
Malleable Iron	42.9	42.5	34.4
Steel	42.9	41.3	36.9
Nonferrous	42.8	42.8	39.4

Labor Turnover Rate (Oct.)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	7.8	5.7	4.1	0.2
Malleable Iron	9.2	5.4	4.5	0.1
Steel	9.9	4.7	3.4	0.3
Nonferrous	8.7	6.3	4.3	0.9

Source: Bureau of Labor Statistics.

Gray Iron Castings—Shipments

(Net tons[1])

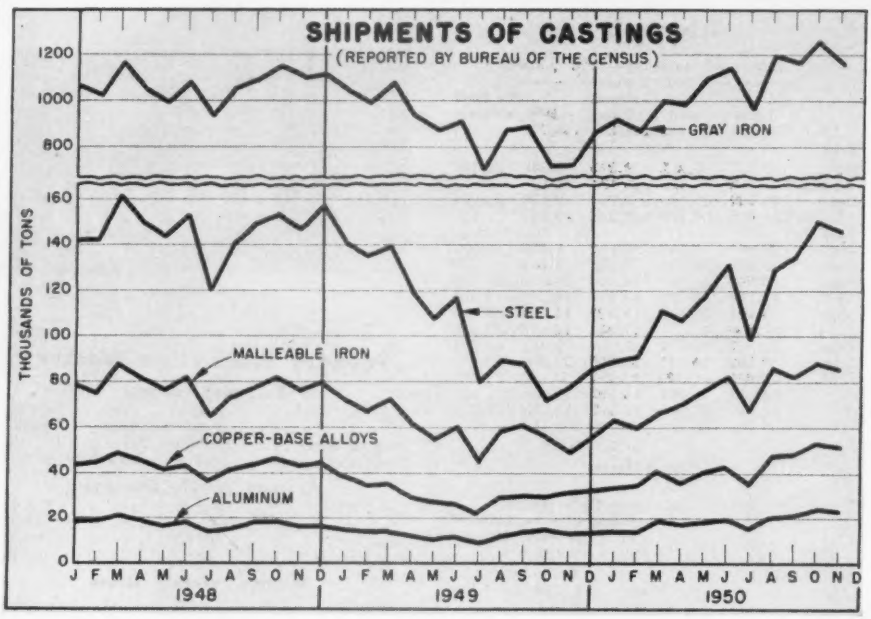
	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels		Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	For Sale	Total[3]	Total[3]	Total
1948	12,785,909	7,131,405	8,296,843	3,839,671	1,979,740	865,022	719,784	641,164	1,149,553	639,989	.....
1949											
Nov.	718,703	395,107	489,076	206,795	62,937	26,620	38,006	33,324	71,639	57,045	938,629
11 mo.	9,687,112	5,080,717	6,102,807	2,474,652	1,592,582	672,619	520,797	462,836	963,979	506,947	.....
Dec.	862,172	440,409	521,613	200,460	183,660	87,241	34,772	30,281	65,764	56,363	892,458
Total	10,549,284	5,517,527	6,624,420	2,675,411	1,776,242	759,860	555,569	493,117	1,029,743	563,310	.....
1950											
Jan.	913,321	449,577	573,743	214,752	188,152	88,244	34,254	29,409	64,095	53,077	914,185
Feb.	864,189	416,594	551,060	201,468	169,605	75,832	33,417	29,187	63,363	46,744	873,455
Mar.	995,782	500,195	635,403	244,122	170,082	71,317	44,898	39,357	89,264	56,135	921,575
Apr.	981,126	483,862	621,368	233,397	182,420	77,923	42,768	37,972	82,774	51,796	922,255
May	1,095,111	572,887	684,632	277,447	195,021	86,016	46,219	40,185	104,529	64,710	977,833
June	1,136,129	613,084	713,811	300,863	197,474	91,377	45,672	41,672	106,980	72,192	1,039,618
July	961,450	507,867	595,918	241,632	177,154	82,363	35,066	30,560	94,438	58,874	1,286,579
Aug.	1,201,569	677,134	747,046	335,868	199,770	92,340	52,508	46,681	131,127	71,118	1,670,380
Sept.	1,159,240	648,966	722,667	325,019	203,191	94,968	44,707	40,304	121,556	67,119	1,794,118
Oct.	1,254,901	700,512	792,764	364,607	220,821	100,082	46,516	41,023	119,105	75,695	1,839,866
Nov.	1,160,770	656,745	733,570	343,073	194,271	85,057	44,382	40,068	115,465	73,082	1,930,176
11 mo.	11,723,588	6,227,423	7,371,982	3,082,248	2,097,961	945,519	470,407	416,418	1,192,696	690,542	.....

Steel Castings—Shipments

(Net tons[1])

	All Castings			Carbon Steel			Alloy Steel			Unfilled Orders[2]
	Total	For Sale	Railway Specialties[3]	Total	For Sale	Railway Specialties[3]	Total	For Sale	Railway Specialties[3]	Total
1948	1,760,032	1,335,295	442,258	1,366,913	1,063,027	425,965	393,981	272,374	16,293	.....
1949										
Nov.	76,820	50,685	7,270	54,632	35,221	6,810	21,805	15,464	460	117,865
11 mo.	1,165,427	812,218	223,718	883,368	622,249	214,479	275,626	189,969	9,239	.....
Dec.	85,033	53,079	9,258	60,864	37,205	8,831	23,644	15,874	427	122,887
Total	1,250,460	865,297	232,976	944,232	659,454	223,310	299,270	205,843	9,666	.....
1950										
Jan.	88,821	57,996	9,298	64,616	41,559	8,607	24,205	16,437	691	142,484
Feb.	91,827	62,045	10,920	66,843	44,473	9,589	24,984	17,572	1,331	165,186
Mar.	111,772	77,588	15,281	82,458	56,492	14,012	29,314	21,096	1,269	185,611
Apr.	106,964	75,133	17,406	79,912	56,008	16,124	27,052	19,125	1,282	201,643
May	117,944	83,845	20,552	88,202	63,658	18,811	29,742	20,187	1,741	198,078
June	131,097	94,637	27,065	96,365	72,427	24,653	34,732	22,210	2,412	206,799
July	98,269	68,874	15,734	70,122	51,204	14,577	28,147	17,670	1,157	255,418
Aug.	128,369	94,413	24,922	92,197	70,721	22,952	36,172	23,692	1,970	329,944
Sept.	134,574	96,738	25,295	98,523	74,052	23,992	36,051	22,686	1,303	427,969
Oct.	149,558	109,660	30,048	112,704	85,157	28,493	36,854	24,503	1,555	521,846
Nov.	145,929	108,263	30,775	110,476	84,316	29,245	35,453	23,947	1,530	537,666
11 mo.	1,304,124	929,192	227,296	962,418	700,067	211,055	342,706	229,125	16,241	.....

[1] Source: Bureau of the Census. [2] All cast iron pipe is shipped for sale. [3] For sale only.



Coke Production and Consumption

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1948	74,861,928	74,214,497	3,750,300
1949			
Nov.	3,504,656	3,618,796	215,239
11 mo. .	57,831,171	57,259,339	2,506,518
Dec.	5,617,906	5,903,287	228,203
Total ..	63,449,077	63,162,626	2,734,751
1950			
Jan.	5,461,719	5,878,562	255,224
Feb.	3,982,336	4,626,521	202,239
Mar.	5,226,489	5,330,772	240,981
Apr.	6,087,079	5,941,701	277,098
May	6,313,632	6,310,454	293,056
June	6,225,024	6,245,877	276,521
July	6,359,566	6,274,054	267,037
Aug.	6,399,936	6,404,094	270,411
Sept.	6,244,285	6,226,380	267,698
Oct.	6,646,249	6,539,684	332,128
Nov.	3,530,400	6,124,716	317,045
11 mo. .	62,476,715	65,992,725	2,997,418

Index of Foundry Equipment Orders

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1949	1950
Jan.	149.9	159.3
Feb.	144.4	113.1
Mar.	190.8	225.2
Apr.	172.0	160.6
May	121.9	294.9
June	164.9	622.7
July	146.6	401.8
Aug.	127.1	693.6
Sept.	166.6	483.8
Oct.	133.5	526.8
Nov.	270.4	885.5
Dec.	201.0	526.2

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufactures Association.

Ingot Brass and Bronze

(Shipments in net tons)

	1949	1950
Apr.	10,695	22,118
May	11,114	23,643
June	9,696	25,093
July	10,220	21,609
Aug.	14,194	29,689
Sept.	16,208	28,811
Oct.	18,036	32,240
Nov.	18,488	31,748
Dec.	17,960	28,757
Total	175,643	303,563

Source: Ingot Brass and Bronze Industry

Castings Production

In Philadelphia Federal Reserve District

(December, 1950)

Type	Percentage Change From Nov., 1950	Dec., 1949
Gray Iron	— 9.3	+26.8
Malleable Iron	+48.1	+140.5
Steel	+ 5.1	+65.9
Nonferrous	—15.3	+12.0

Source: University of Pennsylvania.

Iron and Steel Scrap Consumption

(Thousands of gross tons*)

	All Scrap		By Type of Furnace: Cupola		Air		Electric	
	Total	Purchased	Total	Purchased	Total	Purchased	Total	Purchased
1949								
Nov.	3,037	1,434	612	310	53	17	291	180
11 mo.	44,531	20,693	7,302	4,843	734	253	3,860	2,375
Dec.	4,750	2,229	666	352	67	23	349	233
Total	49,281	22,922	7,968	4,175	801	276	4,239	2,608
1950								
Jan.	4,906	2,267	699	337	71	25	433	259
Feb.	4,539	2,149	670	315	71	27	417	253
Mar.	5,101	2,430	778	372	87	31	497	296
Apr.	5,119	2,451	766	365	79	29	493	300
May	5,333	2,552	837	416	85	32	539	324
June	5,122	2,483	864	427	92	33	533	317
July	4,708	2,244	669	318	79	28	490	295
Aug.	5,202	2,454	862	426	108	39	568	327
Sept.	5,170	2,468	819	404	109	40	579	348
Oct.	5,643	2,707	866	437	108	40	643	384
Nov.	5,293	2,598	841	431	107	39	593	364
11 Mo.	56,136	26,803	8,671	4,248	996	363	5,785	3,467

Pig Iron Production and Consumption

	Production** (Standard grades—1000 net tons)					Consumption* (By type of furnace, 1000 gross tons)			
	Total	Foundry	Malleable	Basic	Low Phos., Intermediate Low Phos. & Bessemer	Total	Cupola	Air	Electric
1949									
Nov.	2,687.5	192.5	131.3	2,024.0	339.7	2,476	331	15	5
11 mo.	48,242.7	3,572.2	2,070.5	37,352.9	6,247.1	43,272	4,125	215	83
Dec.	5,166.0	249.7	218.6	3,959.6	738.1	4,656	385	20	13
Total	53,408.7	2,821.9	2,294.5	41,312.5	6,979.8	47,928	4,510	235	96
1950									
Jan.	5,209.0	239.3	226.4	4,033.2	710.1	4,719	421	20	10
Feb.	4,120.1	151.1	187.9	3,239.3	541.8	3,890	396	20	80
Mar.	4,546.8	232.4	201.2	3,554.9	558.3	4,267	448	23	8
Apr.	5,502.8	259.2	229.1	4,298.3	716.2	4,954	449	23	11
May	5,773.6	257.7	223.5	4,572.3	720.1	5,203	474	24	13
June	5,549.3	209.5	257.7	4,393.8	688.3	5,033	494	25	13
July	5,804.2	269.3	282.2	4,561.2	691.5	5,018	403	23	14
Aug.	5,706.2	257.0	284.0	4,407.3	757.9	5,136	516	30	18
Sept.	5,614.6	244.0	257.2	4,380.9	732.5	5,092	500	26	17
Oct.	5,836.8	284.1	260.6	4,541.2	741.0	5,219	466	31	13
Nov.	5,609.2	264.9	260.2	4,374.4	709.8	4,817	462	30	14
11 mo.	59,272.6	2,593.4	2,745.1	46,356.8	7,567.5	53,348	5,029	275	311

* Source: U. S. Dept. of Interior, Bureau of Mines

** Source: American Iron & Steel Institute

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Industry BRIEFS

ROCKWELL Mfg. Co., 400 North Lexington Ave., Pittsburgh 8, has acquired Pittsburgh Valve & Fittings Division of Pitcairn Corp., and Pittsburgh Valve & Fittings Corp., 700 Newell St., Barberton, O., Pitcairn subsidiary. The Barberton plant includes a mechanized foundry for manufacture of valve castings, and will be operated as one of Rockwell's meter and valve divisions, under direction of L. A. Dixon, vice president. R. G. Caouette, general manager in charge of manufacturing, Meter and Valve Division, has been named general manager in Barberton. J. A. Strachan, general sales manager, Pittsburgh Valve, continues in that capacity, as well as all district managers and sales staff.

* * *

Independent Pneumatic Tool Co., 175 State St., Aurora, Ill., maker of portable power tools, has acquired Armstrong-Whitworth & Co., Pneumatic Tools Ltd., Gateshead-on-Tyne, England. Robert G. Faverty, formerly manager of Chicago and Detroit branches for Independent Pneumatic, has been named managing director in charge of the new affiliate. E. R. Wyler, vice president-director of exports, and James A. Perham, chief engineer, will handle expansion of the pneumatic tool works. Armstrong-Whitworth name will be retained under the new ownership.

* * *

Over 500 visitors attended the open house of General Metals Corp., Los Angeles plant, Feb. 8, 7-9:30 p.m. The open house was held in response to the many requests from persons who wished to see what is considered by many a model plant and foundry. Specializing in serving the aircraft, oil, and plumbing industries, the plant employs 350 persons working 50 hours per week. DO work makes up 30-40 per cent of the company's backlog.

* * *

Worthington Pump & Machinery Corp., Harrison, N. J., has acquired the land, building, and equipment of National Transit Pump & Machine Co., 19 North Petroleum St., Oil City, Pa.* The National plant, covering about 500,000 sq ft, will be used by Worthington for production of equipment related to the national defense program.

* * *

Meehanite Metal Corp., Pershing Square Bldg., New Rochelle, N. Y., has arranged with Empire Pattern & Foundry Co., Tulsa, Okla., for manufacture and sale of Meehanite castings. Meehanite has licensed the following foreign companies to produce Meehanite castings: H. Incledon & Co., Johannesburg, South Africa, and Johnson & Fletcher Ltd., Salisbury, Southern Rhodesia.

* * *

Guy L. Warden & Sons, 209 West Twelfth St., Los Angeles 15, formerly district representatives in lower California for the Johnson Corp., Three Rivers, Mich., will now cover all of California as well as Curry, Josephine and Jackson counties in Oregon. Another office at 5200 East Twelfth St., Oakland 1, Calif., has been opened by the Warden company to handle steam specialties and boiler room equipment manufactured by Johnson Corp.

* * *

Western Foundry Co., P. O. Box 878, Tyler, Tex., maker of cast iron soil pipe and fittings, machinery castings, etc., has tripled gray iron casting production capacity. New cupola and blower system have been added to melting equipment. Last year the company occupied a new $30,000 plant which brought its gray iron casting production capacity to 150 tons per day.

* * *

As result of a recent merger, Crescent Truck Co., Lebanon, Pa., will be operated as a division of Barrett-Cravens Co., with sales of electric industrial trucks and tractors handled from the general office of the parent company, 4609 South Western Blvd., Chicago 9. Engineering and manufacturing operations will continue in Lebanon. No major changes in personnel are contemplated.

* * *

Trojan Foundries, 3117 Oak Lane, Dallas, Tex., has been organized for production of brass and aluminum castings. Wayland Boles, formerly president, Sani-Wax Co., Okla., is board chairman. Philip Andell, previously associated with Gluntz Brass & Aluminum Foundry, Cleveland, and formerly with Anchor Foundry, there, is president in charge of production. Mrs. Boles is secretary.

* * *

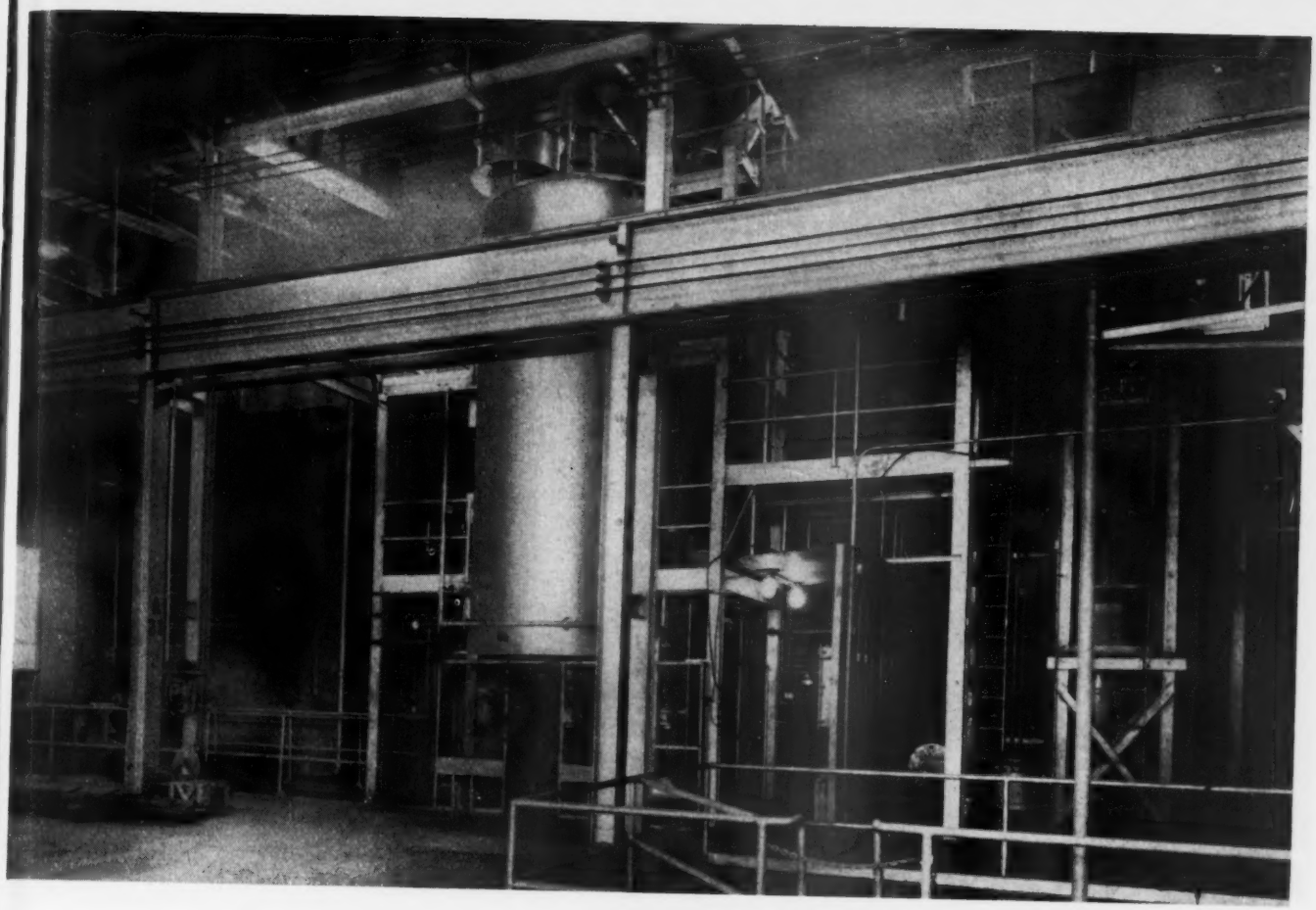
Brown Instruments Division, Minneapolis - Honeywell Regulator Co., Wayne & Roberts Ave., Philadelphia, is expanding its facilities into the recently acquired Thomas M. Royal plant, Philadelphia. About 60,000 sq ft of undeveloped property also has been acquired adjacent to the new site.

* * *

Norton Co., Worcester 6, Mass., recently opened a new electric furnace plant in Cap-de-la-Madeleine, Que.,

(*Continued on page* 200)

NEW FACTORY BRANCH STORE has been constructed by Link-Belt Co., Chicago, at 5020 Centre Ave., Pittsburgh 13. It provides space for stocking power transmission and materials handling products and serves as headquarters for Pittsburgh personnel. Otto W. Werner is district manager



A view of a Nichols Sand Reclamation System in a large Eastern foundry

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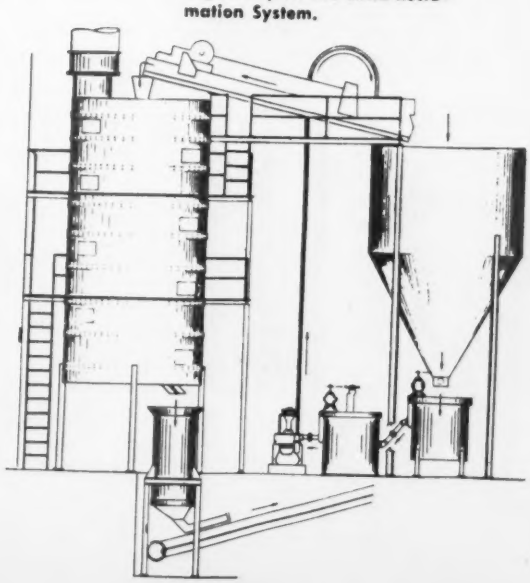
Schematic layout of Nichols High Temperature Sand Reclamation System.



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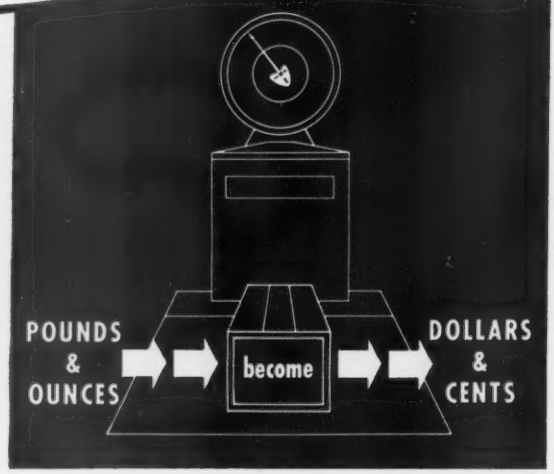

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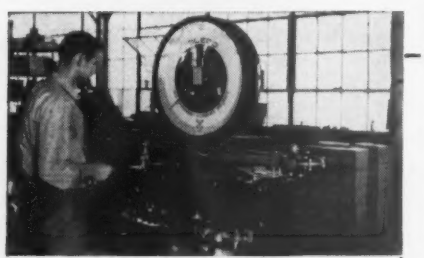

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* * *

Great Lakes Aluminum & Brass Foundry, Milwaukee, has been incorporated with common stock listed at 500 shares, no par value, to engage in manufacture, research and treatment of castings and foundry products. Incorporators are Edward Muellenback, Joseph Chmielewski, Delbert Chmielewski and Harvey R. Habeck, 208 East Wisconsin Ave., Milwaukee.

* * *

Chain Belt Co., Milwaukee, has begun construction of general office building on West Greenfield Ave., at Beloit Rd., there. Upon completion of the building, contemplated for October, present offices at 1600 West Bruce St., will be moved to the west Milwaukee plant. New 70 x 140 ft building will house private and general offices.

* * *

American Cyanamid Co., 30 Rockefeller Plaza, New York 20, has changed the name of its resin from Cycor to Cyacor. Name change applies to liquid resin binder, known as Cyacor 191 and dry resin binder, Cyacor 151, used as foundry sand core binders. There is no change in composition nor specifications.

* * *

United States Pipe & Foundry Co., East Burlington, N. J., has acquired United Concrete Pipe Corp., 419 West Arrow Highway Blvd. Park, Los Angeles. UCPC will continue under the same management. United States Pipe also is building a new plant in Decoto, Calif. It is expected to be in production this summer.

* * *

S. I. Pattern & Casting Co., Richmond, N. Y., has been incorporated with $10,000 capital to manufacture foundry facings, tools, machinery, etc. Incorporators are George E. Cassel, 99 Sharpe Ave., Edward C. Hering, 107 Harrison Ave., and Antimina Pagano, 15 Beach St., Staten Island, N. Y.

* * *

American Steel Foundries, 410 North Michigan Ave., Chicago 11, has purchased the Diamond Chain Co., Indianapolis, manufacturer of chains, sprockets, and couplings, for a reported $8 million.

* * *

Cincinnati Milling Machine Co., 4701 Marburg Ave., (Oakley) Cincinnati 9, plans enlargement of its

plant, with additions to machine shop and foundry. Machine shop addition, 140 x 270, will cost approximately $260,000 and foundry unit, enlarged 105 x 275 ft, approximately $180,000.

* * *

Commonwealth Machine Products, New York, has been incorporated with 200 shares of capital stock, no par value, to operate as iron and brass founders. Incorporators include A. Theodore Canova and Thomas A. D. Canova, Brooklyn, N. Y., and Philip F. Halle, New York.

* * *

Wheelco Instruments Co., Chicago, has appointed Ansell & Goda, 3432 Connecticut Ave., Washington 8, district agents in District of Columbia, Virginia, and part of Maryland. Former territory agent, Phipps & Bird Co., will continue as authorized resale agents of Wheelco instruments.

* * *

Ushco Mfg. Co., Buffalo, has been incorporated with $100,000 capital, to manufacture steel forgings, iron and brass foundry products. Incorporators are John M. and Lydia A. Glaser, 98 Hallam Rd., and James M. Carter Jr., 67 Windsor Ave., Buffalo.

* * *

Auburn Foundry Inc., 635 Eleventh St., Auburn, Ind., suffered damage estimated at $500,000, Jan. 16, when fire, of undetermined origin, swept the entire block square structure.

* * *

Louisiana Pipe & Foundry Co., 7770 Linwood Ave., Shreveport, La., has been incorporated with common stock listed at 250 shares, no par value, to manufacture machinery.

* * *

Roots-Connersville Blower Corp., Connersville, Ind., has appointed Koerner Engineering & Supply Co., Portland, Oreg., sales agent for Oregon and Washington.

* * *

Ferrum Industries Inc., was incorporated recently in New York. Directors are: Charles Evan, Pauline Klein and Emanuel L. Kayman, 21 East 40th St., New York.

* * *

Swan-Finch Oil Corp., 338 Hudson St., Hackensack, N. J., is moving its research laboratories to the home address.

* * *

Whitehead Metal Products Co., New York, has moved its Baltimore metal warehouse to larger quarters at 4300 East Monument St., Baltimore.

* * *

Waterman Steamship Corp. has sold its Mobile, Ala., foundry to Mobile Stove & Pulley Mfg. Co. of that city.

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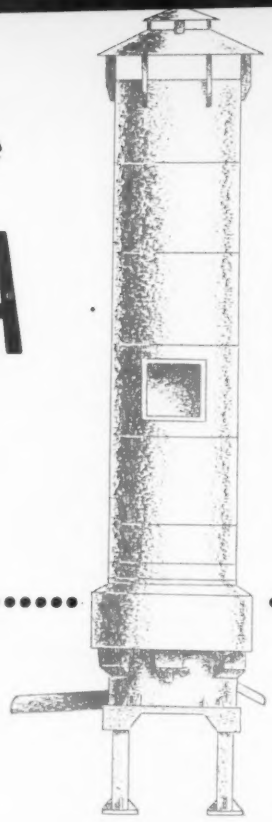
How to use the CUPOLA

By BERNARD P. MULCAHY
President
Fuel Research Laboratory Inc.
Indianapolis



Concluding his discussion of the tap hole and cupola bottom, the author describes types of charging equipment and metal handling

IN ADDITION to the method of constructing the tap hole, as described last month, the important point is its size. This should be carefully determined in order to balance the metal withdrawal against the melting rate. It is evident that this ties in directly with the previous remarks regarding the slag hole. It is again suggested that commercial tap hole blocks be used rather than to construct the tap hole by hand. This will insure the same size each day.

Bottom—In laying the bottom it is essential first that the doors themselves be in good serviceable shape. The hinges should be intact and the doors should fit snugly at the center joint. The "props," three preferred, should be mounted on concrete cast piers using metal shims only for tightening; or metal jacks are acceptable. Remember that in loading the cupola the charge ranging in weight up to 10,000 lb must drop the full distance to the coke bed, and the early impacts are terrific. The doors therefore must bear this impact without cracking the sand bottom.

Sand for the bottom should be screened first through a No. 4 riddle to remove all iron. It can be taken from a regular floor heap, with a permeability of not less than 65 per cent and with moisture approximately 5 per cent. Careful measurement of the amount required will permit the same thickness and slope each day.

After first spreading the sand approximately to its depth, it is hand tamped with the tamper, firmly but *not* hard. Hard ramming should be only at the rim and across the door joint. The bottom is then leveled properly to give the 2-in. slope (not less than 2 in.) from rear to front and again leveled and finally tamped. The bottom should slope directly toward and level with the bottom of the tap hole.

After the sand bottom is finished, cover the surface with several thicknesses of paper bags (cement or other) or a uniformly laid layer of wood or bottom boards to protect it from puncturing when the wood is charged. This is a *must*.

Equipment—

Receivers: Any vessel interposed between the cupola and the carrying ladles may be termed a receiver. Its function, depending on design, intent and capacity is to:

a.—Serve as a temporary storage of metal.

b.—Even out metal composition.

c.—Permit an intermediate treatment of the metal before pouring, such as desulphurizing.

The form of the receiver may take almost any shape from a simple "bull" ladle mounted on trunnions on an *A* frame holding one charge, to the covered *U*-shape type of several tons capacity. They may be insulated or not.

Shop demands largely dictate the use and type of receivers. In considering the installation and use of receivers both the advantages and disadvantages should be thoroughly investigated. Advantages are:

1.—If of sufficient capacity the receiver will collect several charges of metal, thereby averaging out the normal variation of composition.

2.—The receiver acts as a reservoir of metal for variable shop demands.

3.—If desulphurization of the metal is desired, this can be accomplished in the receiver in a batch manner.

4.—A receiver lends itself to continuous pouring from the cupola, and attendant continuous slagging, both of benefit from an operating standpoint.

Disadvantages are:

1.—Additional cost of equipment.

2.—Additional maintenance cost.

3.—Temperature loss of metal—60°—120°F.

4.—May not function to average out composition because of continuously drawing off metal as quickly as poured.

The use of receivers should not be regarded as the complete answer to cupola metal variation or shop demand. They can serve a useful purpose, but their actual advantage is limited to specific instances.

Mechanical Chargers: This equipment has come into use in recent years for two reasons—increased tonnage demand at the individual shop; higher labor costs.

Mechanical chargers must be regarded as a necessary part of any modern shop pouring over 50 tons per day, and frequently even where less tonnage is poured.

As is usual in a process as complicated as cupola melting, the introduction of a change in one of the major factors will necessarily introduce complementary changes in results. In this instance it can be stated safely that no mechanical charger to date can equal the proper positioning of the material as well as good hand charging. This is not as serious a drawback as might appear because, before mechanical charging, very few cupolas were properly hand charged.

The types of mechanical chargers in use are:

1.—Skip buckets. Generally loaded at ground level, elevated on a vertical or inclined rail and discharged at the lip or door of the cupola.

2.—Inclined or vertical hoist with bottom discharge buckets. This type is considered to give better distribution of material. Attention is called to the different types of buckets used—cone bottom, single door, double door, cloverleaf (four door).

The cone bucket is simple in de-

(*Concluded on page* 204)

for Best Performance

KEOKUK ELECTRO-SILVERY

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(*Concluded from page* 202)

sign and excellent in distribution of materials. It is held to have the disadvantage of restricting the size of material charged, but the writer feels that this is a good fault rather than a criticism. The single door bucket impacts the material greatly, while the double door discharges the material to the center of the cupola.

While the type of charging equipment is frequently a function of plant conditions and space, the type of bucket used in most instances is not. In selecting the bucket employed full consideration should be given to all factors.

3.—Jib Crane. This type of equipment recommends itself because of its low cost and application in a limited area. It can employ any one of the foregoing buckets.

4.—Gantry or Monorail—These systems differ only in the method of transferring the bucket from the ground to the cupola. They are generally adapted to the requirements of individual conditions.

All mechanical chargers have the advantage of charging a greater quantity of material per unit time at less cost than hand charging. Additionally, they can charge a greater quantity of material with fewer men employed.

One of the principal advantages of mechanical charging is the fact that simultaneously with the installation of the charging equipment provision has been made for weighing the components of the charge. Frequently with hand charging this was estimated. Also, better records are generally kept when mechanical charging is employed. In general, the advantages of lower cost operation far outweigh the disadvantages.

In considering mechanical charging one of the important factors is the travel time required for a single trip. Frequently this is not given the study it requires and can result in having to make changes in the charge weights to compensate. These changes may not be beneficial to melting conditions.

To minimize coke breakage with mechanical chargers, it should be charged by itself. Travel time and the melting rate may not permit this. The coke then must be elevated with the metal charge. When this is necessary the coke should be placed on top of the metal in the bucket and not on the bottom. This will lessen breakage.

Hot Metal Handling—This is an extremely important phase of cupola melting and is seldom considered in its proper relationship to the entire process. We constantly strive to maintain high metal temperatures from the cupola, spending thousands of dollars for new cupolas, mechanical chargers, scales, hot blast, laboratories, metallurgists, etc., but we may completely neglect a scrutiny of the method employed for transferring the metal from the cupola to the mold.

To illustrate, we may be melting iron at the cupola at a temperature of 2800°F + but at the same time deliver the metal to the molds at a temperature of near 2400°F, representing a loss of some 400°. This, of course, is excessive but not unusual. Possibly this loss is of no great concern because the castings do not require a higher pouring temperature. Generally, however, casting losses are considerably less with higher pouring temperatures.

The above loss can occur as follows:

a. Metal from cupola delivered to receiver 2800°F.

b. From receiver to "bull" ladle temp. loss 80°—100°.

c. Bull ladle (uncovered) to line ladle 100°—150°.

d. Line ladle to hand ladle or pouring ladle 100°—150°.

Layout of the shop may dictate the method necessary to transport the metal, but it is advisable to study carefully the system employed to determine what improvements can be effected. For example, it is frequently possible to eliminate one handling of the metal without too great an expenditure and this will not only save at least 100° of metal temperature but will probably also speed up pouring.

Covered ladles offer another means of lowering temperature losses; insulated ladles also can be employed.

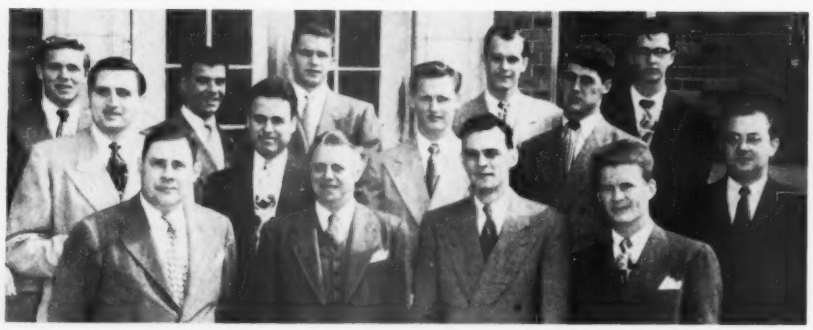
Many shops pouring with hand ladles could well employ the monorail floor system with suspended ladles actuated with rack and pinion. Where hand ladles are used it is not unusual to see several floors waiting for metal because of slowness of delivery.

The teapot style ladle is very efficient in transferring clean iron by means of the dam action. These ladles more than pay for themselves in the better iron poured.

It appears incongruous to exert considerable effort in improving melting conditions at the cupola and allow so many temperature losses to remain because of improper methods of handling. This is certainly a spot in the process where a little study can effect considerable financial savings.

All ladles should be preheated before use, but not with the metal itself. The practice of heating the ladles with the first iron poured and then pigging the metal is extremely expensive. A simple torch rack can be constructed in any shop to preheat the carrying ladles, and oil or gas torches used to heat the larger ladles. This is not only better economy, but more effective.

(*To be continued next month*)



SCHOLARSHIP WINNERS: Eleven students, majoring in metallurgical engineering and mechanical engineering, were awarded scholarships for the academic year 1950-51 at Missouri School of Mines and Metallurgy by the Foundry Educational Foundation. Shown with school personnel they are, left to right, front row: Dr. D. S. Eppelsheimer, professor of metallurgy and adviser for local chapter of the AFS; Dean Curtis L. Wilson; George W. Sullivan and Joe L. March; second row: William J. Ruprecht; Wade C. Wurtz; Gillum E. Burgess; Leland Beverage and Albin B. Charneski; third row: Jack M. Wheeler; James Salmas; Robert E. Schuchardt; George H. Wagner, instructor, and Norbert F. Neuman

---

Howe Scale Co., Rutland, Vt., has opened two new branch offices: 2524 Walnut St., Denver, with Daniel O. Ferris as manager, and 2215 McKinney Ave., Houston, Tex., with Henry K. Leonard as manager.

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Boron has established itself definitely among the resources of iron and steel manufacture. In the economical and easily soluble form of Ferro-Boron it is approved and used by leading producers to heighten the qualities of cast iron, malleable iron, cast steel, rolled steel, tool steel and other ferrous products.

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Adventures of BILL

By PAT DWYER
Illustrations by RICHEY

BILL showed remarkable self control the other night while I wrote the concluding lines on a rather long letter. Not a word. Not an impatient gesture. Not even a sniff or a clearing of the throat. He sat there as quiet as a mouse. Well, maybe I had better take that back. The only mice that ever crossed my path were not quiet. Certainly Mickey the king of them all is not noted for his quiet disposition. Apparently as a symbol of comparison the mouse is out. I might say Bill sat there as quiet as a graven image, and then defy you to kick that one around!

He waited patiently while I pulled the last sheet out of the machine and examined it hastily for mistakes. The everlasting hoping for the best and fearing for the worst. One of the seven wonders of the world—at least to me—is the manner in which the fiendish perversity of inanimate objects causes the letters of certain words to combine in wrong formation.

In this particular instance I found I was one up on the spelling gremlin. I applied my modest signature to the bottom of the paper and was about to insert the paper in an envelope when Bill came out of his trance.

"If I am not too nosey," he said. "If the subject is not of the deepest political significance; if you are not under a vow of perpetual silence, might I inquire politely the how, what, when, where and why of this here now long correspondence?"

"Now that you have twisted my arm, I am willing to confess that no secret is involved and no vow is violated when I admit that the letter is addressed to John Cameron, who represents the high justice, the middle and the low in a foundry in Kirkintilloch, which you may or may not know is a town in Scotland."

"I know Mr. Cameron. Maybe you know and may be you do not know that he also operates a foundry in India where one of the principal items is cast iron railroad ties. Wood ties last no time. The ants eat 'em up. In fact competent railroad men have been heard to state that the ferocious insects are equipped to chew anything, even any kind of iron with a brinnel under 200. I would not know about that. From a somewhat random contact with railroad men I gathered the general impression that when and if a tall tale contest is staged, the railroad men would give the foundrymen a tough wrestle for first place. However, this reference to Inja and its ants with the alligator shear jaws is taking us too far afield. All I want to know is what prompted you to write a letter half a yard long to a man in a foreign country."

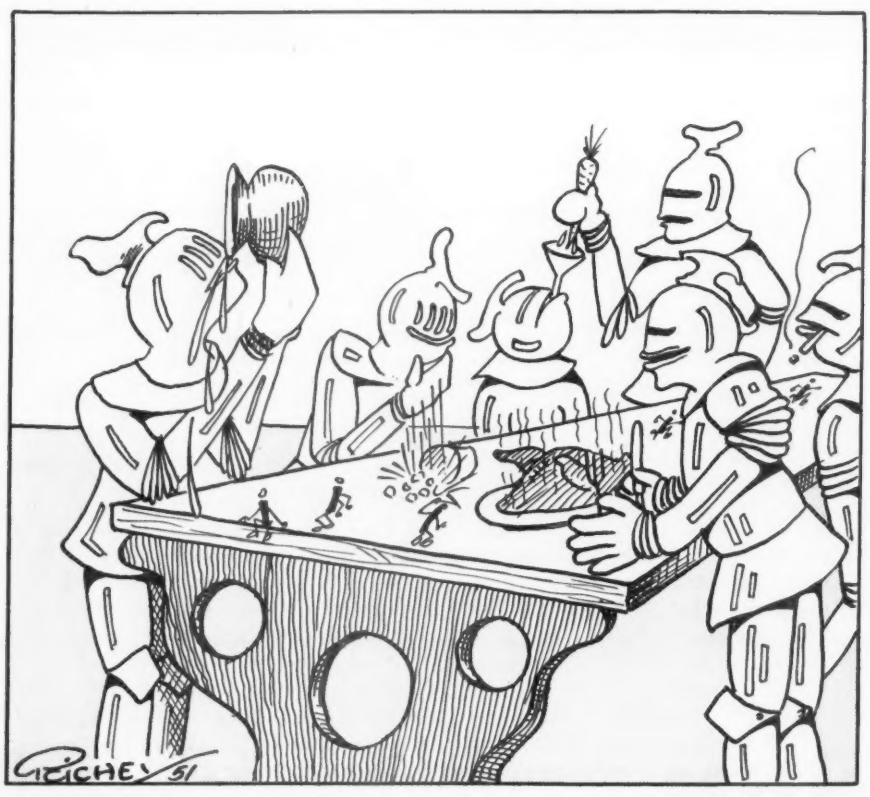
"I wish the answer to all your questions was as simple as the answer to that one. The letter was written in reply to a letter from Mr. Cameron accompanying a pamphlet containing the text of a lecture he had delivered before a local antiquarian society titled 'The Rise, Growth and Future of Ironfounding.' With characteristic modesty he hoped I still remembered him. Essaying a slight facetious touch I began my letter 'O aye. A' ken ye fine.' Translated into English that means—"

"Ye needna tell me whit it means. I have known Scottish people and I have worked with Scottish molders in many places and over a period of many years. At one of the stopping places on the grand tour which I made between the ages of 21 and 26 I had the pleasure and honor of squiring a charming wee lass who came originally from Scotland. She could speak the Doric or plain English with equal facility. She could switch from one to the other as readily as Babbie in J. M. Barrie's delightful romance *The Little Minister*. I remember one time—"

"I also remember a most revolting tintype of yourself, taken some time during that period. The young lady may have been a champion single or double talker, but with the evidence of that old tintype in front of me I incline to the opinion that she either was weak in the eyes, or just plain reckless. With my earnest and sincere compliments you may hang yourself on either horn of that dilemma. I rather fancy, as the boys say over 'ome, I rather fancy that will hold you for a while. In the meantime, and before you get out the old interruption stinging needle, I shall read the letter which aroused your curiosity. For several reasons I shall skip the first page."

Your name and the name of your town have been brought to my attention on many occasions. To make the reading as easy and painless as possible I shall set down several

(*Continued on page* 208)



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PLANT AND ARCHITECTURAL ENGINEERING

(*Continued from page* 206)

items numerically. (1) Several years ago a lad named Guy Patric or Gilpatric wrote a series of stories which were published in the *Saturday Evening Post*. The central character was one Glencannon, a frowsy, heavily mustached chief on a British tramp, the *Inchclif Castle*. Apparently he was a highly competent and ingenious engineer. Of course, that is a somewhat redundant statement in the face of the universal opinion that Scottish marine engineers, especially the chiefs, are the best in their profession.

In addition to Glencannon's acknowledged competency as an engineer, he had a positive gift for getting involved in the most tremendous difficulties, and the most wonderful and weasel-like facility for getting out through the big end of the horn. Invariably he kept a more or less generous supply of Dugan's Dew o' Kirkintilloch hidden in his cabin. Invariably also he ascribed his success in creeping out of deep dark wells and other pitfalls, to generous dollops of this well known, potent and infallible remedy.

After the series had been running some time I read an indignant protest on the subject from the town fathers in Kirkintilloch in council assembled. In a general way I gathered that this charming and highly moral town does not, and never did countenance the use or manufacture of alcoholic beverages.

My personal objection to or criticism of the stories was that the author apparently did not have a true phonetic ear. In his pitiful attempt to incorporate the Scottish dialect he combined letters into words that never were used either above or below the border. I'll admit the stories were nice enough examples of the story teller's art, but this occasional atrocious spelling was enough to bring the reader up standing. If you ever struck a knot or a steel spike while sawing a cross grain spruce railroad tie impregnated with gravel and iron ore you know what I mean.

I speak as one with some authority and endowed with reasonably accurate phonetic ears. They are generous in size, but with your kind permission we may skip that feature. I have associated with Scottish people and it is many and many years since I learned to read and enjoy Scottish dialect as presented by those master story tellers, S. R. Crockett, James M. Barrie, Robert Louis Stevenson and Ian McLaren.

(2)—In my boyhood days a famous lady singer included "The March of The Cameron Men" in nearly all her programs, either as a featured number or as an encore. She was a magnificient junoesque creature, although quite mature to our boyish minds. Somehow the word had seeped around that she was at least not a day under twenty-five.

In a beautiful gown cut to show as much as possible, and of course different on each occasion, she presented the ideal figure for the period. Modeled on that well upholstered and well known emblem of industry the bummeley bee, she showed a huge upper and lower section joined by a microscopic waist. A profile view showed a billowy excrescence at the back, known for some mysterious reason as a bustle. Naturally, I never had the occasion, the opportunity, or you might say the gall to apply a 2-ft rule or a tape measure, but an offhand guess was that she wore a No. 18 corset. This bit of expert knowledge came to me as a result of working for nearly two years as general all-around slave in a fashionable drygoods store. That was before I was fired and given the opportunity of starting at the molding trade under the sharp and fostering (I hope the printer does not make that festering)

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8 to 10 are accommodated simultaneously at a 54-in. Bradley. Self-flushing bowl prevents collection of waste water.

• Adequate and sanitary washroom facilities are as important as any of your safety measures.

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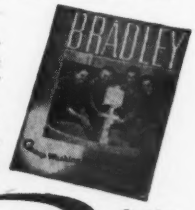

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eye of a highly competent foreman who had learned his trade in Glesga'. His black eyes and swarthy complexion suggested at times to my random fancy that the invading Romans, Phoenicians, blackke and hairy sea dogges, did not spend all their time picking daisies, robbing bird nests and making collections of colored pebbles and pressed fern leaves.

When the lady threw back her head and announced to one and all 'Tis the march, 'tis the march, 'tis the M-A-R-C-H of the Cameron men, a delightfully thrilling sensation tickled the combined spines of the audience. Irrespective of nationality the short hairs crept up and tickled the backs of their necks. A wildly delirious moment that comes only a few times in a life time.

(3) At the beginning of the first world war one of my Scottish relatives joined the 82nd Cameron Highlanders in Winnipeg. He was with the first contingent that sailed out of St. John on the *Cameronian* for the European battlefields. He survived the mud and the rain that never ceased, the rats as big and ferocious as young bull dogs and the ever present lice for the full four years.

(4) I feel kind of guilty inflicting this rambling epistle on a busy man. It is somewhat of a consolation to know that the more or less well filled waste basket is on hand and always available. Maybe I should have written according to *The Complete Letter Writer*: "Dear Sir, your recent interesting letter safely to hand and contents carefully noted." I don't think that would have pleased you and I am quite sure it would not have pleased me. What's the good of all the sweat, blood and tears (Sic) involved in writing a letter if the job does not yield mutual pleasure. If the present effort does not rate me a seat one or two places above the salt when and if I have the pleasure of visiting Cameron Ha', at least it will show that I am *sib*. A species of natural vanity—aren't we all poor sinners—prompts me to hope you will derive a certain amount of pleasure comparable to what I experienced in the composition.

(4) Among the many apprentices to whom I had the pleasure of imparting some of the tricks of the trade I remember particularly a young man of the Cameron clan. He was the No. 1 boy; good looking, clean, healthy and endowed with the nicest manners and morals. He now is employed as foundry superintendent in a town not very far from Buffalo. We occasionally get together for a session where we shake the dust and other accumulations out of the old memory bag and enjoy many a hearty laugh over people, places and incidents connected with a far away plant where we toiled side by side for several years. He is a credit to our profession.

Without doubt you will recognize this as a quotation from a certain passage in Ian McLaren's *Beside The Bonnie Brier Bush*. Parting on the railway platform the distinguished city surgeon turned to the modest general practitioner and dropped into the Doric, the mother tongue in which he was born "Gie's yer haun' McLure. Yer a cr-r-redit ta oor profession!"

Another member of the Cameron family was a darling dancing companion in the far away golden years when we were in our late teens. When all the trees were green lad, when every goose was a swan lad, and every lass a queen! I have but to close my eyes to bring her up on memory's screen, her looks, her walk, her little mannerisms — everything, with the single exception that I

SAVE TIME SAVE LABOR

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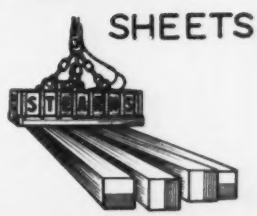
SHEETS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"Small Bite—Big Load"

LIFTING and transporting these two huge steel castings (each weighing 4000 pounds), is everyday work for this STEARNS Lifting Magnet at the Maynard Electric Steel Casting Co., Milwaukee. This 45" diameter circular magnet is one of a team of STEARNS Lifting Magnets used throughout the cleaning room and foundry whenever castings have to be moved — doing the job efficiently and economically year in and year out.

If you handle castings, borings, turnings, pig iron, strip steel, rails, slabs, billets or scrap iron, there's a STEARNS Lifting Magnet EXPERIENCE ENGINEERED to help you save time and money. For the efficient handling of flat steel sheets, plates and bars, be sure to investigate STEARNS Rectangular Lifting Magnets.

STEARNS Lifting Magnets are available in standard sizes in both bolted and all welded constructions. Special sizes and shapes made to meet your requirements.

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cannot recall her first name.

As a member in good standing of the Ancient and Honorable Order of Sand Tossers I enjoyed the laudatory introduction to your lecture by Robert Dickson. Under the wise direction of an estimable and democratic father you went into the foundry and learned all the basic essentials of the trade. The boys in those days did not emulate Scott's derring-do young bravos "Who carved at the meal with gloves of steel and drank the red wine through the helmets barred." *That* I should like to see.

You and your brother sat on bottom boards on the floor with the rest of the shop crew and drank tea from a conical tin can. The lunch was transferred by the fingers from a flat oval tin can to the mouth. What do a few grains of sand, blacking or sour paste rate in the life of a healthy, hungry, growing boy?

"Not bad," Bill admitted. "Not bad a-tall. Only one thing puzzles me. After the grub was chopped up with the steel gloves, how did the tough lads in the metal suits shove the grub and the wine through a few cracks in the iron pots on their heads?"

"Confidentially," I said, "and with the understanding I am not to be quoted, I think Wally had his tongue in his cheek when he wrote the famous lines."

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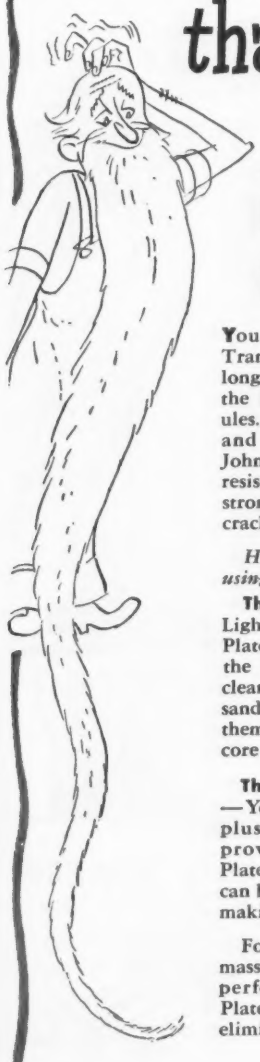

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For core plates of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details, write Johns-Manville, Box 290, New York 16, N. Y.

JM PRODUCTS

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Johns-Manville TRANSITE CORE PLATES

Made of Asbestos

Selection and Use of Anthracite for Cupolas

(*Continued from page* 97)

is convenient to cushion the drop of the anthracite with coke this is usually advantageous.

Even distribution of metal in the cupola is essential to good operation and this is not possible when very small and very large pieces of metal are charged together. It is obviously impractical to maintain uniform size of metal, but it is equally impractical from a performance viewpoint to expect efficient operation and uniform quality metal when charging metal ranging in size from a few ounces to over a hundred pounds. When using anthracite in significant quantities, a high percentage of very large metal is undesirable because the smooth surface, uniform size and high density of the coal tend to cause it to sift through the metal and arrive at the melting zone ahead of the charge it was intended to melt. This results in excess fuel with lower melting rate during early stages of the melt and a deficiency of fuel toward the end with resulting lowering of temperature.

Although not specific to the use of anthracite, performance will generally be improved if the weight of the charge is held within reasonable limits. A charge weight such that the split forms the equivalent of a single layer of fuel is desirable and has been found to give excellent operation, although somewhat larger charges are frequently employed with success. Excessively large charges result in variations in bed height almost equivalent to the thickness of the splits; this results in fluctuations in melting conditions.

Stock Line—In cases where windbox pressure is a limiting factor in wind delivery, it is frequently desirable to keep the stock line height as low as possible. This will relieve the pressure and afford more leeway in the operation.

Recommended Procedure — When first using anthracite it is advisable to make the substitution in steps and to observe the effect of each step before proceeding to the next. In this way potential sources of difficulty can be detected before actual trouble

is encountered. These steps are recommended:

1. Substitute 10 per cent anthracite for an equal weight of coke in the charges. An increase of 5 to 10 per cent in the limestone may be advantageous but is usually not necessary unless the slag is normally rather viscous. Several days' operation under these conditions will indicate whether the limestone should be increased or decreased and whether any significant change in windbox pressure has resulted. A single heat is usually insufficient basis for judgment.

2. Following the above procedure increase the anthracite in approximately 10 per cent steps, with the necessary changes in limestone addition. Depending upon the quality of the coke and anthracite, and on the particular operation, it will usually be possible to substitute up to about 40 per cent anthracite, without any major effect other than an increase in windbox pressure for equivalent wind delivery. Above 40 per cent, however, it may be necessary to consider another factor, namely that of fuel ratio. Depending upon the quality of the coke and anthracite, it may be found desirable to modify the weight of anthracite substituted for coke. A number of tests have indicated that the substitution ratio may vary from about 0.85 to 1.0 lb of anthracite per lb of coke. As the quantity of anthracite in the mixture becomes significant, therefore, the influence of excess fuel may adversely affect melting rate, if no adjustments are made.

3. At what appears to be a safe percentage of anthracite in the mixture, minor changes in substitution ratio can be made to determine the optimum ratio of anthracite for coke. Once this ratio is established, and providing sufficient blower capacity is available, further increase in the percentage of anthracite may safely be tried.

Frequently it will be found that the bed height can and should be lowered a few inches when a substantial percentage of anthracite is used. In general the anthracite will be smaller in size than the coke and, as with all-coke operations, the optimum bed height is a function of fuel size.

4. Where it is desired or necessary to go to all-anthracite operation, it is first advisable to use a coke bed and anthracite charges until experience is gained on the most desirable bed height and the limestone requirements.

In intermittently tapped cupolas, a slight decrease in well capacity may result from an all-anthracite bed but this is usually not a significant factor. In continuously tapped cupolas, one of the main problems will be maintaining satisfactory fluidity of the slag; this is likely to be more of a problem in operations that require a relatively cool metal than in higher temperature operations.

Recent Experience—A few typical operations that have recently used anthracite with success are shown in Table I. These operations include foundries that operate heats from 2 to 8 hr duration, pouring castings ranging from a few ounces to several hundred pounds, and melting from 0 to 55 per cent steel scrap in the charges. Regular tuyere and balanced blast cupolas are represented. The 36-in. cupola has a special high velocity tuyere arrangement, consisting of four 3-in. I.D. pipes, which is claimed to give better blast penetration when using anthracite operation.

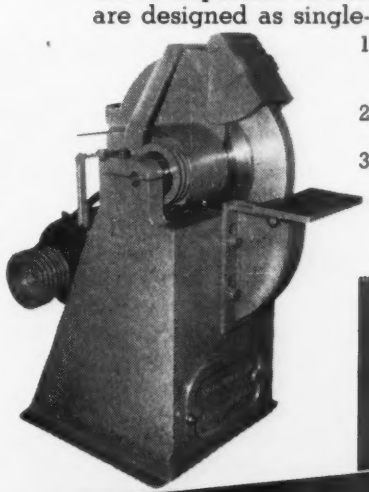
Cast Iron Soil Pipe Institute, has opened offices in the Heurich Building, 1627 K St., N. W., Washington 6.

High-Speed PRODUCTION

FOR THE FOUNDRY

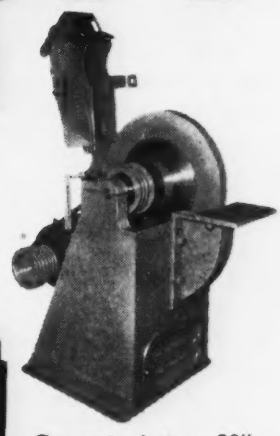
Three important reasons why FOX Grinders are designed as single-wheel machines:

1. Speed changes can be made at the proper wheel diameter.
2. Less space is required for each installation.
3. Proper operating room is provided on either side of the wheel.



FOX

HIGH SPEED
STAND GRINDERS



These Stand Grinders have been designed for use in foundries where high-speed production is required. Maximum clearance at the grinding face has been provided in both units to properly take care of the innumerable casting shapes encountered throughout the foundry industry.

Comes in 4 sizes: 20" light duty—24" light duty—24" heavy duty —30" heavy duty.

FOX GRINDERS, Inc.

OLIVER BUILDING PITTSBURGH 22, PA.

Electronic Core Baking

(*Concluded from page* 154)

the baking tunnel. No start up time is necessary, since the baking tunnel is ready at the flip of a switch.

Cores are baked electronically in a matter of seconds or a few minutes, so that only a small number of plates (or driers) are needed. The cores are baked rapidly, and sagging is rare. Distribution of heat is uniform throughout the material, and thus there are no stresses to cause cracks or dimensional instability. Temperature is controlled precisely, preventing under-baking or over-baking. The operation is on a production-line basis, providing a continuous flow of cores to the molding floor.

The company has found that 240 typical cores of various sizes and shapes are baked electronically in 40 minutes. No cooling racks are needed. When the cores emerge from the tunnel they are cool enough to inspect immediately. Advance scheduling is not necessary. Cores are baked in a few seconds or minutes, and molding schedules can be changed at will.

At present 95-99 per cent of the castings produced measure up to the company's standards. The finish is fine and there are no objectionable fins, protrusions or irregularities to be removed.

The high-frequency sand core baking unit used by United will bake one-half ton of resin bonded cores of optimum size, shape and moisture content per hour. One man easily takes care of the baking cycle. Capacity can be readily increased by adding heating sections.

United Foundry Co. is a subsidiary of the Drake Non-Clinkering Furnace Block Co., Weatherly, Pa. The plant was acquired by the Drake organization in 1947, to provide a source of castings that are prime components of the firm's products. Later, the plant's production was broadened to include the castings for tank cars, refinery and textile machinery, steam-electric plants, and other industrial purposes.

The members of United's management team are Ernest Priebe, general manager; Paul Priebe, secretary, and Wilbert Schumaker, general superintendent. All are veteran foundrymen and noted for their skill in setting up efficient manufacturing operations.

Book Review

Atlas of Defects in Castings; fabricoid; 75 pages 6 x 9½ in.; prepared by the Technical Council, Institute of British Foundrymen; available through the Institute office, St. John Street Chambers, Deansgate, Manchester 3; seven shillings and sixpence to members, 21 shillings to nonmembers.

Printed on heavy coated stock, and only on one side of each page, the long list of photographs showing actual examples of ferrous and nonferrous casting defects, are presented in intimate detail. Although not primarily intended as a textbook on how to make good castings, the book should prove to be of considerable help in this direction. A table of contents, arranged alphabetically, lists 95 types of casting defects. Throughout the book, each item is covered in the following manner: Photo, name of defect, brief description, cause and suggested remedy.

A typical example illustrates the method of treatment: Blowholes (entrapped oxide and slag). Localized areas of irregular shaped cavities, admixed with metallic shot and slag, usually exposed during machining operation. The defect most commonly is

What every foundryman should know about

BERYLCO BERYLLIUM COPPER CASTING ALLOYS

High Strength • Good Electrical Conductivity • Excellent Castability

Cast beryllium copper as useful as wrought. Age-hardened beryllium copper castings have the same desirable properties as wrought products . . . strength up to 180,000 psi, hardness to 450 Brinell, or electrical conductivity up to 50 percent that of pure copper.

Other important characteristics. Berylco has a relatively low pouring temperature and good fluidity, resulting in maximum detail as cast with minimum machining. It retains ductility at subzero temperatures, has desirable properties over a wide temperature range, high resistance to wear and corrosion.

End use. Berylco Beryllium Copper castings are being used more and more in circuit breakers and switch gear; for bearings, gears, and pump parts; as welding jaws, resistance welding dies, and electrode holders.

Any casting method applicable. Berylco Beryllium Copper is easily adaptable to a variety of casting methods, including sand, permanent mold, pressure, plaster mold and investment.

Berylco is readily processed. High-strength alloys are machined before hardening. High-conductivity alloys can be machined hardened or unhardened. Since Berylco is an age-hardening alloy, tensile strength of solution-annealed castings can be more than doubled by simple low-temperature heat treatment.

OUR CASTING SPECIALISTS WILL BE GLAD TO CONSULT WITH YOU ON ANY OF YOUR FOUNDRY PROBLEMS. WRITE TODAY.

Send for "Designing with Beryllium Copper Casting Alloys."

ALLOYS AVAILABLE IN 5 LB., 2½ LB. AND 3 OZ. INGOTS

Properties of Berylco Beryllium Copper Casting Alloys

Annealed and Heat Treated Properties	Berylco 20C	Berylco 275C	Berylco 10C and 50C
Tensile Properties			
Ultimate Tensile Strength	150-175,000	140-165,000	95-120,000
Proportional Limit (0.002% Offset)	105-125,000	85-115,000	45- 65,000
Yield Strength (0.20% Offset)	120-155,000	110-125,000	55- 85,000
Elongation % in 2 in.	1-5	1-5	5-15
Rockwell Hardness	C40-45	C42-48	B92-100
Electrical Conductivity, %	20-25	18-23	45-50

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found on the topmost part of castings or underneath cores. The example shown is part of the bore of a gray iron cylinder liner casting, section approximately 1 in. thick. Cause—Entry of slag into the mold through careless skimming or pouring methods. Badly designed pouring basin and too large down gate can be a contributory cause. Cold metal. Suggested Remedy—Ensure that the metal is hot as it comes from the furnace and that all slag is removed by thorough skimming. Use the skimmer at commencement of pouring. See that the pouring basin and down gate are properly designed so that they may be filled quickly and kept filled with metal. Use plugs on large pouring basins. Provide filter core, skimming gate or slag trap in runner system. If necessary use higher pouring temperature.

MIT to Offer Training In Instrumental Analysis

Two one-week specialized training programs in instrumental analysis will be offered July 9-13 and July 16-20 as part of the 1951 summer session at Massachusetts Institute of Technology. Dr. David N. Hume and Dr. Lockhart B. Rogers, both of the MIT department of chemistry, will conduct the two courses.

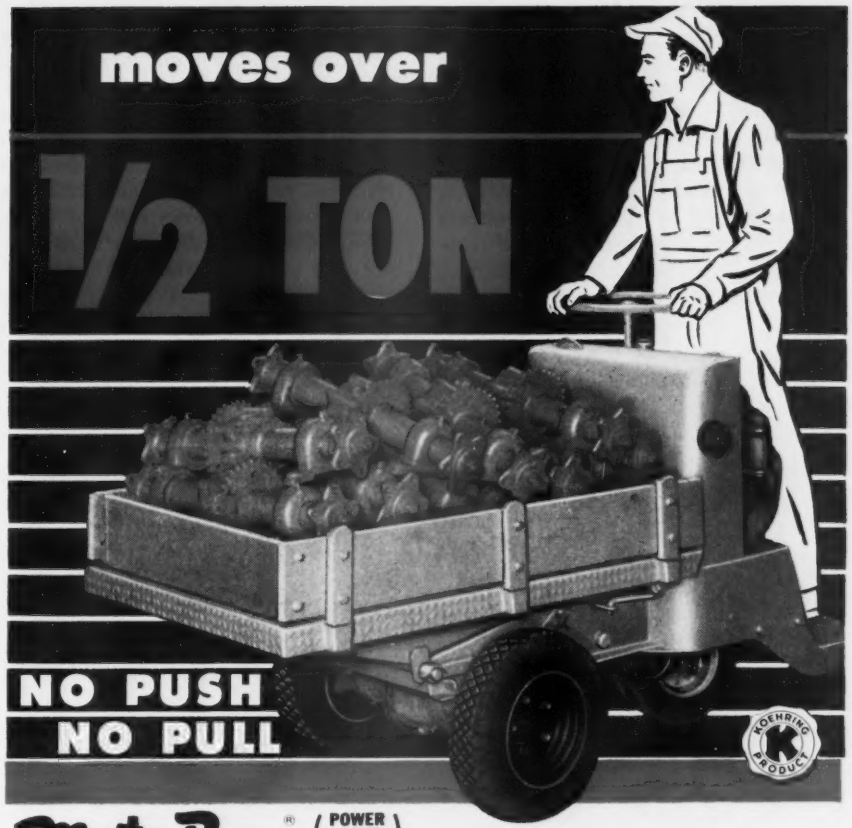
The first week's program will be devoted to electrical methods of instrumental analysis and will emphasize potentiometry, polarography, conductimetry, amperometric titrations, and applications of self-balancing recording potentiometers. Optical methods of instrumental analysis, including spectrophotometry, colorimetry, fluorimetry, turbidimetry, nephelometry, and flame photometry, will be the subject of the second program.

A number of commercial instruments will be available for operation and evaluation by members of each program. Tuition for each one-week period will be $65.

Application forms may be obtained from Prof. Walter H. Gale, director of the summer session, at room 3-107, Massachusetts Institute of Technology, Cambridge 39, Mass.

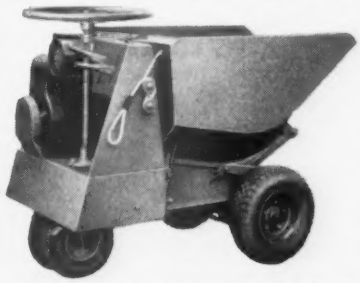
Aluminum Data Book

To meet the demand for more factual information on aluminum alloys and mill products, Reynolds Metals Co., 2500 South Third St., Louisville, has issued a 194-page publication, "The Aluminum Data Book," condensed into a pocket-size manual. Wire bound to permit flat opening, the 6 x 9 in. book contains 61 illus-



Moto-Bug® (POWER WHEEL-BARROW) has full power both forward and reverse . . . requires no pushing, *no pulling* to travel, back up, or spot. Effortless steering and maneuvering, through 4-to-1 gear ratio on large steering wheel, and optional riding step further minimize operator fatigue. As a result of its easy handling and big load capacity, Kwik-Mix Moto-Bug quickly pays for itself in more output per man-hour. Sturdy 4-ft. flatbed platform carries up to 1200 lbs., tilts for easy pull-away when unloading. 32" width easily clears narrow aisles and doorways.

10 CU. FT. HOPPER is interchangeable with flatbed, and extends Moto-Bug economies to handling foundry sand, coke, scrap, concrete and other bulk materials. Snub-line to hopper body lets operator control rate of discharge, pour partial load when necessary, or operator can let gravity body dump full load instantaneously. Standard-make, 4-h.p., 4-cycle gasoline engine takes full load up 20% ramps, grades and through soft footing. Dual steering wheels and choice of big single or dual drive tires provide ample load flotation, traction and handling ease on or off-pavement.



OTHER INTERCHANGEABLE UNITS for Moto-Bug include fork lift for transporting pallets, bulky boxes, crates . . . and scraper blade which can be used without removing hopper body. On all kinds of material handling jobs, you'll save time, labor with Moto-Bug. See your Kwik-Mix distributor soon or write today.

Mail Now to: KWIK-MIX COMPANY, PORT WASHINGTON, WIS.

Send us more facts on low-cost Moto-Bug with: ☐ 10 cu. ft. hopper ☐ 1200 lb. flatbed ☐ scraper blade ☐ fork lift

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trations showing various operations in aluminum production.

Included are 117 tables of data on physical, chemical and mechanical properties, standard tolerances, weights, standard sizes and production limits, as well as fabricating data. Tables show relative corrosion resistance, action of many chemicals on aluminum, elevated and low temperature properties, fatigue strengths, minimum bend radii, joining methods, finishes for aluminum, and other information.

There are 33 pages of explanatory text covering alloy and temper designation systems, heat treatable and non-heat treatable alloys, casting alloys, casting methods and foundry practice. Another section covers pig and ingot products while separate sections on physical, chemical and mechanical properties define terms used and special characteristics of aluminum. Cross index covers both tabular and text material.

Book will be sent without charge to engineers, designers and technical men who request it on company letterhead.

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This line frequency induction furnace, so universally used in the wrought brass industry, is now, because of improved linings, available for melting ferrous alloys used in the foundry industry.

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AJAX *Electrothermic Corp.*
AJAX *Electric Co., Inc.*
AJAX *Engineering Corp.*

Fire Effects of Bombing Attacks Discussed

Civil Defense Liaison Office, Office of the Secretary of Defense, has prepared for the National Security Resources Board a booklet entitled "Fire Effects of Bombing Attacks." It discusses fire warfare experience during World War II in German and Japanese cities, including the atomic bomb attacks on Hiroshima and Nagasaki. Principal factors involved in the fire susceptibility of American cities are set forth, and comparisons are made between the experiences in Germany and Japan and what might happen if the United States is bombed. Copies of the booklet are available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, for 15 cents.

Book Review

Production Planning and Control, by Thomas M. Landy, cloth, 436 pages, 6 x 9¼-in., published by the McGraw-Hill Book Co., New York. Price $5.50.

Growth of industrial engineering in modern industry has emphasized the necessity for proper production planning and control. In an effort to bring a more scientific approach to the problem, the author, who is production control manager, Cleveland Trencher Co., Cleveland, has outlined the prevailing principles and laws that govern the various phases of production planning and control.

Part one deals with installation and operation; part two with principles, functions and cases. An appendix includes information on terminology, abbreviations and symbols, and a factory numbering system.

Issues Management Books

American Management Association, 330 West 42nd St., New York 18, has published a group of pamphlets dealing with various subjects. In the production series are: "Co-ordination Between Engineering, Production and Sales," and "Controlling Indirect Labor and Maintenance Costs," both 50 cents. Personnel series: "Human Relations Job of Personnel Management," 75 cents, and "Maintaining Two-way Communication," price $1. Marketing series: "Performance Rating and Job Analysis for Sales Personnel," 75 cents. Insurance series: "Operating under Non-occupational Disability Laws," 50 cents. Packaging series: "How

General Electric Tackles its Packaging, Packing and Shipping Problems," $1.25, and "Protecting the Package in Transit," 50 cents.

Offers Textbook Series For Foundry Apprentices

California State Department of Education is preparing a series of three sets of books for use by molding and coremaking apprentices. First of these sets is available from the Department of Education, Bureau of Textbooks and Publications, Sacramento 14, Calif.

It covers safety, arithmetic for the foundryman, hand and machine molding, coremaking, metallurgy and melting, cleaning, and workmen's legal rights and benefits. The material is presented in simple, practical terms with problems taken from specific shop situations. Designed for classroom use, each set of books consists of a workbook for the apprentice and a testbook for the teacher.

Book Review

Foundry Sand Control, by W. Davies, cloth, 212 pages, 6 x 9 inches, published by United Steel Companies Ltd., Sheffield, England, and available from Ceramics Publishing Co. Inc., Newark, N. J., for $6.

In his introductory remarks the author states that real sand control, as distinct from sand testing, is still in its infancy, and real control should anticipate and correct any deterioration in sand properties long before it has any disastrous effect on the castings. In developing the latter premise he takes what many will consider an unusual approach—discussions of the constitution of clay-bonded sands; characteristics of sand grains, and clay bonds, etc. However, it is quite logical since, to have a good understanding of a material like molding sand composed as it is of several components, it is necessary to have a knowledge of the characteristics and properties of the components, and their effect on the final product.

Following the introduction chapter II discusses the constitution of clay-bonded molding sands while chapter III describes the characteristics of sand grains including mineralogy, size distribution, shape and significance of the characteristics. Chapter IV is concerned with the characteristics of clay bonds while in chapter V on preparation of molding sands such phases as plasticity of clay bond, milling, development of bonding, optimum moisture and relation of plastic range to type of clay are discussed. Bulk density is the topic of chapter VI on shaping of the sand, and chapter VII is concerned with the various factors relating to and affecting strength of molding sands. Chapter VIII on mold surface relates to texture, friability, stability, refractoriness and thermal conductivity. Chapter IX on the foundry sand system embraces rate of renewal of the bond, live clay content, routine sand control, interpretation of control graphs, and sand testing laboratory. Selection of foundry sands is discussed in chapter X, and that of bonding clays in chapter XI. Concluding chapter XII on future of foundry sand control points out that much practical research remains before mold design can become a strength of materials problem to be solved in the drawing office, and some of the information needed is indicated. The book also contains three appendixes on mechanical grading of sands, identification of clay minerals, and relation of bond strength of a synthetic sand to the proportion of bond.

Ready to Pour?

Too hot, too cold — or just the right temperature to pour? That's what the foundryman must know about his molten metals!

Pouring at correct temperatures means strong, dense castings. Pouring "off temperatures" results in shrinkage cracks, pitting, and many other flaws.

Here Marshall Enclosed-Tip Thermocouples supply the answer. These instruments give you the exact temperature of your molten brass, bronze, aluminum and magnesium. Castings can be poured at correct temperatures.

Marshall Thermocouples are always ready; need no preliminary adjustments. L. H. Marshall Co., 270 W. Lane Ave., Columbus, Ohio

MARSHALL
THERMOCOUPLES

New EQUIPMENT *and Supplies*

For Additional Information on these Items Use Reply Card—Page 219

(1)—Pattern Coating: Caroline Co., 7603 Forsyth Blvd., St. Louis 5—Long lasting wood pattern coating is said to stand up well under sandslingers and practically eliminate the many tiny holes in wood patterns which ordinarily result from jabbing of vents in molds. Durometer readings on coated surfaces show 10 to 15 points below that of steel. The coating is said to reduce dry rot of wood patterns in storage for indefinite periods. It is impervious to moisture, as normally applied, so that in a pattern completely covered on all surfaces, the moisture content in the wood is retained. Additional claims are that it bonds well to wood and withstands heat up to 350° F.

For More Details Circle No. 1—Page 219

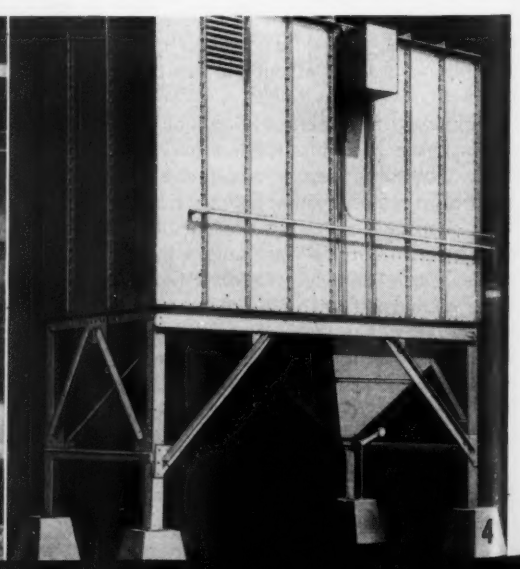
(2)—Blow Tube: Martin Engineering Co., 704 Rose St., Kewanee, Ill.— Sand tube designed to protect foundry coreboxes used on blowing machines is available in any length with outside diameters ranging from 5/16 to 1¼-in. in ⅛-in. increments. It is guaranteed for more than 100,000 blows and is designed to deliver perfect cores with positive elimination of sand stems. The steel tube is heavily plated and rust proof. A fused-on rubber tip made of wear resistant rubber is said to be unaffected by abrasion, oil, water, or time.

For more Details Circle No. 2—Page 219

(3)—Hot Belt: Imperial Belting Co., Dept. F, 1750 South Kilbourn Ave., Chicago 23—New belting has been developed for conveying and elevating materials at temperatures up to 600° F. Belting is made of heavy silver duck combined with asbestos and special insulating materials. It has been used successfully in handling various hot materials, including hot castings and foundry shakeout sand.

For More Details Circle No. 3—Page 219

(4)—Dust Filters: Ruemelin Mfg. Co., 3860 North Palmer St., Milwaukee 12—Tubular cloth filters are said to collect dust particles of ½ micron in size from dust laden air and to recover over 99.8 per cent of all dust loads. Filter bags are enclosed in a heavy gage steel airtight housing with hoppers, sloped at the proper angle for discharging accumulated dust, at the bottom. An expansion chamber beneath the collector tubes, ample tube spacing and unrestricted openings help lower resistance to air movement and keep power requirements at a minimum. Dust-laden air is drawn or blown into the dust chamber by a fan. Because of the low air velocity in the dust chamber beneath the bag plate the heavier dust particles drop into the hoppers below. The remaining fine dust moves upward with the air current inside the filter bags where it is filtered out. An electric bag shaker, which operates only when the fan motor is shut down, removes dust from the bags. Dust deposited in the hoppers is removed through a dust outlet valve equipped with agitator



type lever. Vacuum and pressure type filters are available. Both are offered in single or multicompartment styles. In single compartment models operation of the unit stops when the filter bags are cleaned. In multicompartment styles operation continues in some compartments while filters in one compartment are being shaken out.

For More Details Circle No. 4—Page 219

Lenses: American Industrial Safety Equipment Co., 3300 Lakeside Ave., Cleveland 14—New plastic cover lenses, made in sizes to fit all helmets and goggles, are said to last up to 125 days under ordinary usage. Features claimed include: Freedom from pitting, because sparks are repelled by the material; resistance to heat up to 300°F; freedom from warping or softening at high temperature; freedom from discoloration; possesses high resistance to scratching; and has good optical characteristics.

For More Details Circle No. 5—Page 219

Belting: Chas. A. Schieren Co., 30 Ferry St., New York—New flat belting consists of a layer of rayon tire cords cemented between two layers of leather belting. A low stretch characteristic in service is claimed for the belt. Another feature claimed is that it can be scarfed and made endless with the same methods as any other flat leather belt. Regular belt fasteners or lacing also can be used in the customary manner on this new belt.

For More Details Circle No. 6—Page 219

Blast Cabinet: W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2—Sandblast cabinet for cleaning small parts is equipped with two light fixtures for illuminating the interior, an exhaust fan and a dust bag for making the operation dustless. Its primary use is for cleaning small metal parts with soft abrasives, such as ground corn cobs or ground nut shells. It also can be used with sand or metal abrasives. It has rubber sleeves with rubber gloves attached for both arms of the operator.

For More Details Circle No. 7—Page 219

Metallograph: American Optical Co., Southbridge, Mass.—Metallograph has all controls and adjustments within easy reach. The optical systems for photography and visual observations are coupled to permit all focusing to be done through the visual system, eliminating ground glass focusing. Grain size measurements on all metals are compared directly on the ground glass with standard grain size charts. Case depth and linear measurements are made with an accessory micrometer rule. The objective, eyepiece and camera bellows setting are identified by the standard ASTM magnifications. These range from 50X to 1500X, with 2000X available on special request. Monocular or binocular bodies are available. Metallograph is equipped with a standard Graflex camera back using inexpensive double plate holders. The photographic eyepieces, on a quick-change slide, are designed for optimum photographic results. Objectives are infinity-corrected and balanced for high contrast and good color correction.

For More Details Circle No. 8—Page 219

Fire Extinguisher: Ansul Chemical Co., Marinette, Wis.—Dry powder pressurized fire extinguisher, designed for hazardous metal fires, is said to be effective on fires in magnesium, sodium, potassium, zinc, powdered aluminum, etc. Extinguishing agent fuses and forms an air-excluding crust over the burning metal. It is moisture repellent, free flowing, nontoxic, noncorrosive and nonabrasive, it is claimed. It does not conduct electricity and will not deteriorate under normal conditions. The extinguishers are manufactured in 30-lb, 150-lb and 300-lb sizes. Larger units, including an automatic piped system, also are available.

For More Details Circle No. 9—Page 219

Foot Spray: Waverly Petroleum Products Co., 1724 Chestnut St., Philadelphia 3—New service to help prevent athlete's foot consists of a new sanitary solution, a new type of mechanical spray dispenser, and replacement service for worn pumps for any other kind of spray dispenser now in use. The solution contains the latest accepted ingredients for control of athlete's foot fungi and may be used in any spray dispenser. Each application is fresh and undiluted. The dispenser is a treadle mechanism, employing hydraulic pumps activated by the treading motion. A fine vapor is sprayed through the aluminum grill opening on which the person treads.

For More Details Circle No. 10—Page 219

Strain Gages: Baldwin Locomotive Works, Chester Park & Simpson, Philadelphia 42—New type of SR-4 bonded resistance wire strain gages, self-compensated for temperature variation, are available for use on Dural and steel in the form of single elements, double elements, and rosettes. Principal advantage of the new self-compensating gage is elimination of a second strain gage to compensate for temperature changes, thus saving application time and wiring. Gages for two temperature ranges are offered: 50-300°F and —50 to 300°F. Single element gages for Dural or steel are available in four gage lengths: ½, ⅜, 13/16, and ⅞-in.

For More Details Circle No. 11—Page 219

Temperature Indicators: Tempil Corp., 132 West 22nd St., New York 11—A liquid which, when applied to metal surfaces, will dry and then melt when the metal is heated to a predetermined temperature, is available for indicating temperatures in 12½-degree steps from 113

"Certified" Abrasives
can be used
OVER AND OVER AGAIN!
Switch to Certified Abrasives and keep cleaning costs down! Certified's Samson Shot and Angular Grit are made extra tough by a special automatically controlled hardening process. They wear longer, can be used over and over again . . . and assure fast, efficient, high-quality blast cleaning. Try Certified in your cleaning room and you'll see why it's first choice in hundreds of foundries!
All sizes graded to S. A. E. specifications
Experienced foundrymen say:
Always specify "Certified"
Accepted and used for over 55 years
PITTSBURGH CRUSHED STEEL CO.
Pittsburgh, Pa.
STEEL SHOT AND GRIT CO.
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MEMBER FEMA

to 400°F and in 50-degree steps from 400 to 1950°F. Crayon and pellet forms of the temperature indicator are available in similar intervals from 113 to 2000°F. Pellets can be supplied in 50-degree steps in the range from 2000 to 2500°F.

For More Details Circle No. 12—Page 219

Fork Truck: Baker-Raulang Co., Baker Industrial Truck Division, 1250 West 80th St., Cleveland 2—

Center control fork lift trucks are available in 3000, 4000 and 6000-lb capacities. Overall height of the trucks is 83 in. with telescoping lift of 126 in. Trucks are electrically powered and feature stand-up drive. Steering wheel and well-marked control levers are conveniently located. Operator has an unobstructed view of the end of the forks when engaging the load, and there are no chains in his line of vision when load is in normal traveling position.

For More Details Circle No. 13—Page 219

Hacksaw Blade: L. S. Starrett Co., Athol, Mass.—New power hacksaw blade has a hard, high-speed steel cutting edge integrally welded to a medium hard steel center which, in turn, is welded to a tough steel back. Hardness at the cutting edge is said to insure straight cuts and eliminate tooth stripping. The medium-hard steel center and tough back combine to make the blade shatterproof and virtually unbreakable, it is claimed. Blade is made in all standard power hacksaw sizes—4, 6, or 10 teeth per inch.

For More Details Circle No. 14—Page 219

Motors: Electric Mfg. Co., 1331 Tyler St. Minneapolis—Heavy duty, wound rotor induction motors provide variable speed drive, and also are said to be advantageous on applications requiring high starting torque and low starting current, or

(*Continued on page* 222)

HELPFUL LITERATURE

50. Welding Shield

Magic Welding Shield Co.—2-page illustrated leaflet "Magic Welding Shield" depicts and describes adjustable device which fits welding torch and is set in direct line with eyes and flame.

51. Materials Handling Cranes

Thew Shovel Co.—20-page illustrated bulletin "Lorains in Industry" shows applications of cranes in all types of materials handling operations. Rubber-tired Moto-Cranes, self-propelled Lorains and crawler mounted models are shown in actual use. Suggested materials handling operations are discussed.

52. Direct-Fired Air Heater

Drying Systems, Inc.—8-page illustrated bulletin H-102 is descriptive of type I. D. induced draft direct-fired air heater for industrial applications. Oil or gas-fired unit is available with output ratings from 600,000 to 3,000,000 Btu per hour.

53. Railroad Car Shaker

Allis-Chalmers Mfg. Co. — Illustrated bulletin 07B7221A is entitled "Allis-Chalmers Car Shaker". This unit fits over top of hopper-bottom gondola cars and speeds unloading of granular or bulk materials such as coke, sand and chemicals.

54. Metal Casting Plaster

United States Gypsum Co. — 10-page illustrated bulletin No. IGL-32 covers P-M-C permeable metal casting plaster for nonferrous casting. Made from Hydrocal gypsum cement, it produces smooth permeable molding medium suitable for casting many metals and alloys.

55. Oil Burners

Hauck Mfg. Co.—4-page illustrated catalog No. 411 features series F hand control oil burners for industrial applications requiring 10 to 1 turn down in firing capacity with manual and individual control of oil and air.

56. Trucks & Trailers

Kilbourne & Jacobs Mfg. Co.—32-page illustrated catalog No. 116 covers complete line of industrial and commercial trailers and trucks for all types of materials handling operations. Line includes models ranging from light duty tubular steel hand trucks to fifth wheel type wood or steel deck warehouse trucks. Custom-built trucks can be supplied with capacities up to 50 tons.

57. Portable Tools

Cummins Portable Tools Div., Cummins-Chicago Corp. — 4-page illustrated catalog No. PT43 offers condensed information on line of portable electric tools for industrial use. Line includes portable electric drills, saws, disk sanders and all types of accessories.

58. Materials Pumps

Yeomans Brothers Co.—12-page illustrated manual No. 2300 is descriptive of pumps for handling corrosive and noncorrosive liquids, solids-carrying liquids, and dry and semi-dry materials. Latter Transporter is automatic compressed air or steam aerated machine for conveying heavy materials in bulk transport systems.

59. Vibrating Screens

Link-Belt Co.—12-page illustrated book No. 2354 deals with type CA concentric action vibrating screens for medium and heavy duty service. They are used for accurate sizing, thorough rinsing and rapid dewatering of wide range of materials ranging from ashes to zinc ore.

60. Universal Testing Machines

National Forge & Ordnance Co., Testing Machine Div.—4-page illustrated brochure 501 is guide to table model universal testing machines for tension, compression, flexure, shear and transverse tests on volume or research basis. Machine is offered in capacities of 30,000 and 15,000 lb with 6000 and 600-lb range and 3000 and 300-lb range, respectively.

61. Welding Procedures

Eutectic Welding Alloys Corp.—48-page illustrated "Manual of Welding Engineering and Design" covers properties and applications of various Eutectic low temperature welding alloys, with special emphasis on uses for defense production and maintenance. Joint design, metallurgical data, alloy selection and welding procedures are some of subjects covered.

ADDITIONAL INFORMATION?

For additional information on any of the items described under "New Equipment and Supplies", "Trade Publications" or "Helpful Literature" in this issue — simply circle their corresponding item numbers on one of these cards.

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62. Open Steel Flooring

Dravo Corp.—16-page illustrated catalog No. 1103 discusses different types of Tri-Lok open steel flooring, safety treads and armoring. It contains specification data, safe load tables, installation methods and other pertinent information.

63. Ingot Mold Wash

United States Graphite Co.—4-page illustrated bulletin "Mexican Graphite Ingot Mold Wash" explains how this material produces clean, smooth ingot surfaces, prevents sticking, speeds stripping, and eliminates scabs and inclusions.

64. Dust Collectors

Aget-Detroit Co.—38-page illustrated catalog contains illustrations and specifications of Dustkop dust collectors suitable for dry grinding dust control, collecting buffing and polishing dusts, and control of chips and shavings from both wood and metal working machines.

65. Power Wheelbarrow

Kwik-Mix Co.—4-page illustrated bulletin KM-280-1 shows construction details and applications of Moto-Bug power wheelbarrow. Unit has 10-cu ft or 1200-lb capacity, 1½ to 4-mph speed forward and reverse, 4-hp one-cylinder four-cycle air-cooled gasoline engine and two wheel drive from differential in front axle.

66. Refractory Cements

Chas. Taylor Sons Co.—8-page illustrated bulletin No. 314 discusses properties and applications of Sillimanite Super-Refractory cements. These mullite base cements are widely used in steel, metallurgical, ceramic and chemical process industries for bonding linings in any high temperature furnace.

67. Industrial X-Ray Equipment

Picker X-Ray Corp.—8-page illustrated bulletin No. 21250 lists all types of industrial x-ray equipment and accessories designed for heavy industrial usage. Included are such items as heavily reinforced cassettes, flexible film holders for irregular contours, and illuminator and vernier scale for precision measurements.

68. Compressed Air Drier

Logan Engineering Co.—2-page illustrated bulletin No. 1150 describes Aridifier which cleans and dries compressed air and removes 92 per cent of oil, water and dirt from gas and air lines.

69. A-C Welder

Harnischfeger Corp., Welding Div.—Illustrated bulletin W-71-1 covers features on model TR-180A alternating current welder. Limited-input type unit has welding service range of from 20 to 180 amp and incorporates Dial-lectric heat control.

70. Metal Inspection

Dy-Chek Co. — 4-page illustrated bulletin 500 shows how Dye Penetrant method of nondestructive metal testing is used. Applied by brush, dip or spray method, liquids disclose flaws clearly. Systems can be used in plant or in field.

71. Adjustable Vise

Dodge Mfg Co.—4-page illustrated bulletin A-601 describes and depicts Slide-Set vise that grips like conventional vise but eliminates need for handle spinning. Features include hardened replaceable jaws and No-Pinch handle which affords protection against blood blisters.

72. Electric Motor Bearings

Reliance Electric & Engineering Co.—4-page illustrated bulletin B-2201 contains sketches, cutaway drawings of improved double shielded bearings and their bracket mounting and a design check list for comparing with other bearing arrangements.

73. Air Compressor Drives

Electric Machinery Mfg. Co.—24-page illustrated bulletin No. 32 contains latest information on motor drives for all types of large air compressors. Tables, charts and graphs facilitate matching motor characteristics to compressor requirements.

74. Earthmover

Frank G. Hough Co.—6-page illustrated form 190 and 12-page illustrated form 204 describe models HE and HF Payloader, respectively. Former has ½-cu yd capacity and latter has ¾-cu yd capacity for excavating, earthmoving and bulk materials handling. Both have four forward and four reverse speeds.

75. Variable Speed Drives

Reeves Pulley Co.—12-page illustrated bulletin No. G-509 sets forth basic operating principle of variable speed transmission, Vari-Speed Motodrive and Vari-Speed motor pulley and contains representative rating tables and dimension drawings. Capacities range from ¼ to 87 hp with stepless speed changes within ratios of 2:1 to 16:1.

76. Powered Hand Trucks

Clark Equipment Co.—12-page illustrated booklet SP-1002 deals with new powered hand trucks. Electro-Lift battery-powered and motor-driven model and Hydro-Lift gas-powered type driven by hydraulic pump and hydraulic motor are described in separate sections.

77. Electric Hoist Trolley

Industrial Equipment Co.—2-page illustrated catalog sheet MDT-1050 depicts and describes Moto-Trolley electric hoist trolley designed for attachment to a standard lug-mounted electric hoist. Unit has 65-fpm speed, semilocking worm drive in oil bath, machined steel trolley wheels and removable head axles on all wheels.

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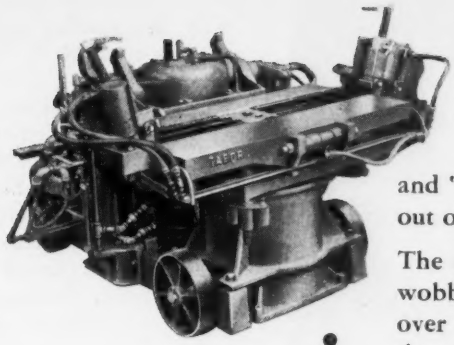


do you have upper-plate wobble?

If "upper-plate wobble" is distracting with dentures, it's downright fatal with rollover plates. You wind up with weakened jarring blows, unequal ramming, and "secondary jolts" that quickly get plate and jar head out of whack. Net result—bad molds and excessive wear.

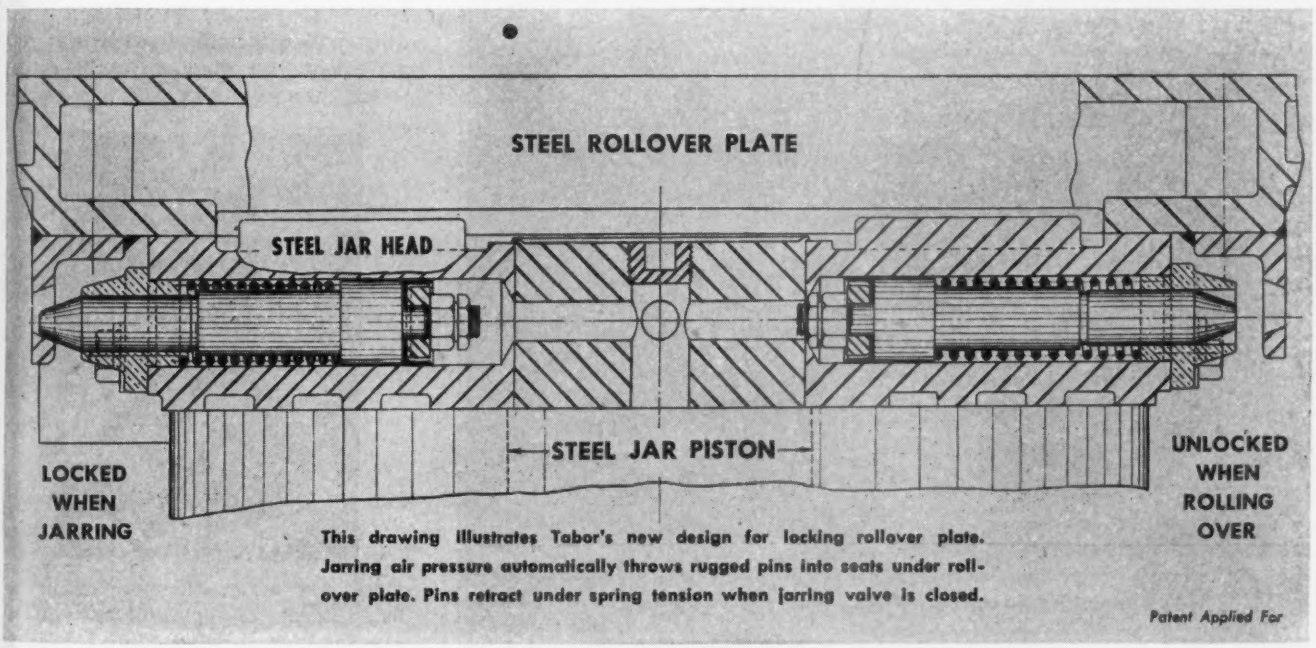
The sketch below shows our engineers' answer to plate wobble on Tabor Rollovers. This construction locks rollover plate and jarring mechanism *into one rigid assembly* the moment jarring air is introduced—a new feature never before offered in jar, power rollover, power draw machines.

Now you get four *new* advantages in Tabor Rollovers:

1. Effectiveness of jarring blow is increased at least 25%.
2. Ramming effect is equalized *all over the mold.*
3. No "secondary jolt" between plate and jar head—adds greatly to life of both members.
4. Does away with all plate wobble, even when handling a mold with uneven weight distribution.

Always big producers, Tabor Rollovers also feature the new quick-change-over table which permits *independent* setting of all four clamps—invaluable in core room or jobbing shop where pattern changes are frequent.

Bulletin #514 gives full details. Write, wire, or 'phone today.



This drawing illustrates Tabor's new design for locking rollover plate. Jarring air pressure automatically throws rugged pins into seats under rollover plate. Pins retract under spring tension when jarring valve is closed.

Patent Applied For

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; Harry H. Reich, Trussville, Ala.

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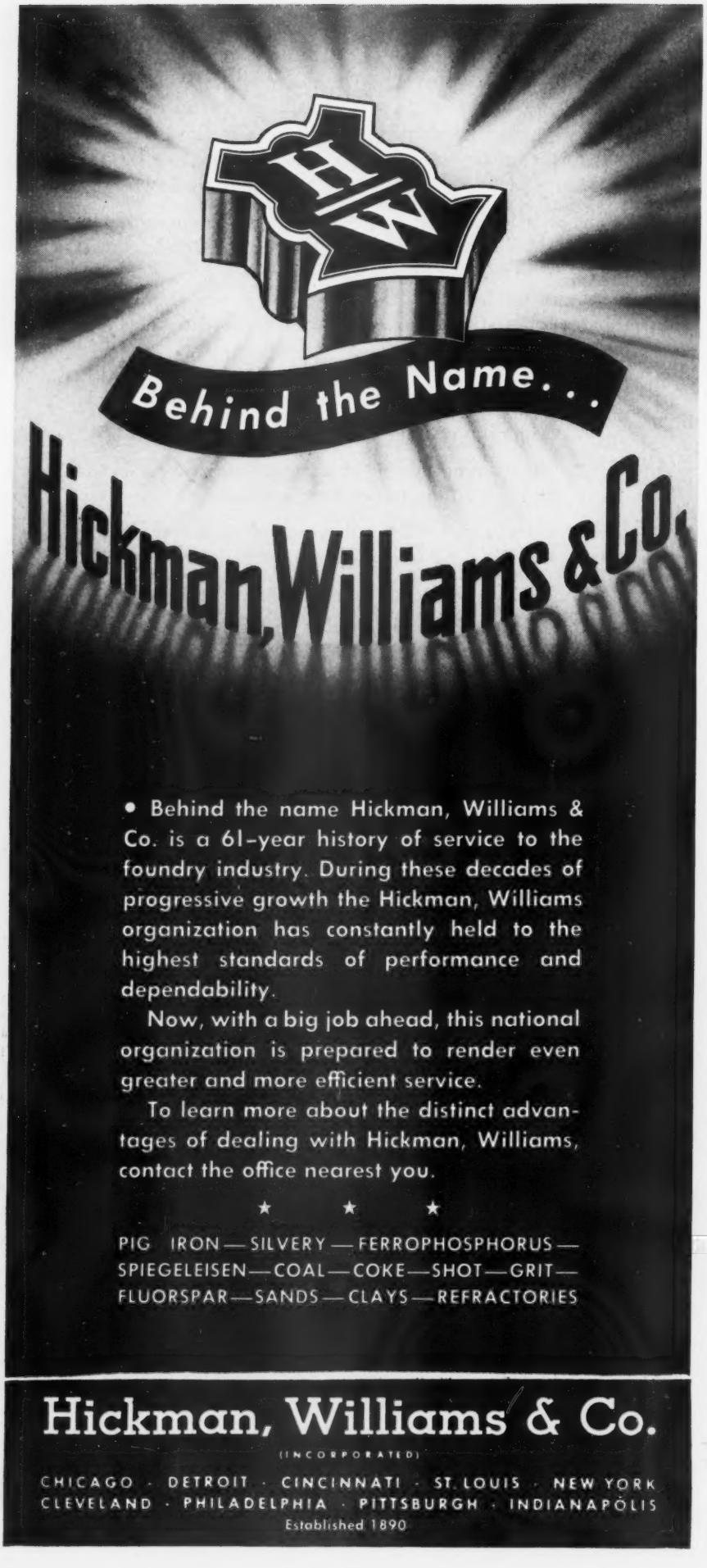
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Established 1890

(*Continued from page* 218)

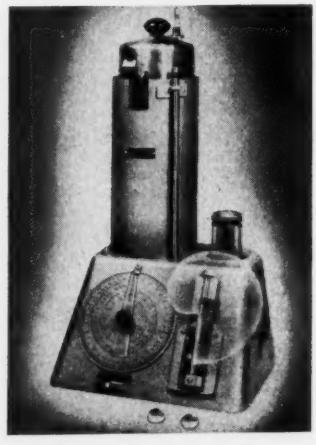
long acceleration periods. Built in ratings from 30 to 1500 hp, the motors offer drip-proof construction as standard equipment. Splash-proof or enclosed, forced ventilation models also are available. Motors are available with either ball or split sleeve bearings easily accessible for inspection and maintenance. Brush pressure is adjusted with a ratchet wheel brush tension adjuster which provides metered step-by-step increase or decrease of pressure on the individual brushes. Finger tip removal of cover plates gives a large opening for access to the brushes.

For More Details Circle No. 15—Page 219

Safety Glasses: Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.—Absorptive safety glasses are designed for eyes especially sensitive to light rays. The new glass tones down all visible light rays evenly. When hardened to approved specifications, it surpasses safety requirements set by the U. S. Bureau of Standards, it is claimed.

For More Details Circle No. 16—Page 219

Permmeter: Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4—Permmeter embodies latest developments in permeability testing. The construction complies with all requirements for standard AFS stopwatch permeabilities and also provides for automatic permeabilities, independent of operator attention. The familiar orifice method has been added for rapid control testing. A clear plastic permeability scale permits improved accuracy for this method.



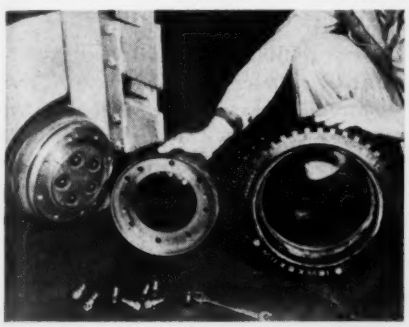
For More Details Circle No. 17—Page 219

Laboratory Oven: Claud S. Gordon Co., 3000 South Wallace St., Chicago 16 — Core baking oven for foundry laboratory work has a heavily insulated chamber 10

in. wide, 12 in. high, and 18 in. deep, designed for maximum temperature of 550°F with automatic thermostatic control. A double type air diffusing system provides for a large volume of air to enter the oven with an equal amount of air intake at both the front and back of the chamber. In this way with a minimum of three to four air changes per minute, convected heat is used to best advantage for drying and baking, rapidly eliminating gases and moisture. Oven also may be used for drying sand samples, binders, and specimens for dry sand strength tests. It operates on 110-volt, 60 cycle, single-phase alternating current.

For More Details Circle No. 18—Page 219

Demountable Tire: Clark Equipment Co., Industrial Truck Division, 258 Champion St., Battle



Creek, Mich.—Demountable cushion style rubber tire is said to require less time to mount than a passenger car tire. It incorporates all the claimed advantages of cushioning, long wear, and superior cut and chip resistance found in its forerunner, which was pressed onto the wheels. It features a tapered hard rubber base reinforced with bead wires, and it can be applied to a tapered base wheel by bolting together the two wheel halves with a standard wrench. An Allen wrench is used to remove plugs.

For More Details Circle No. 19—Page 219

Hoists: Cleveland Chain & Mfg. Co., Broadway & Henry Sts., Cleveland 5—New line of electric cable hoists are manufactured in ½, 1, 1½, 2, 3 and 5-ton capacities. Hoists feature motor enclosed within the cable drum for protection against moisture, splashing liquids, weather, dust, and corrosive atmospheres. Total weight and overall dimensions also are minimized. Gear reduction is through a double internal (epicyclic) gear train that incorporates two load brakes. Equalizing solenoid type motor brake is connected to an up-limit cutoff switch. Designed for operation on 220, 380, 440 or 550-volt, 3-phase, 60-cycle current, the hoists

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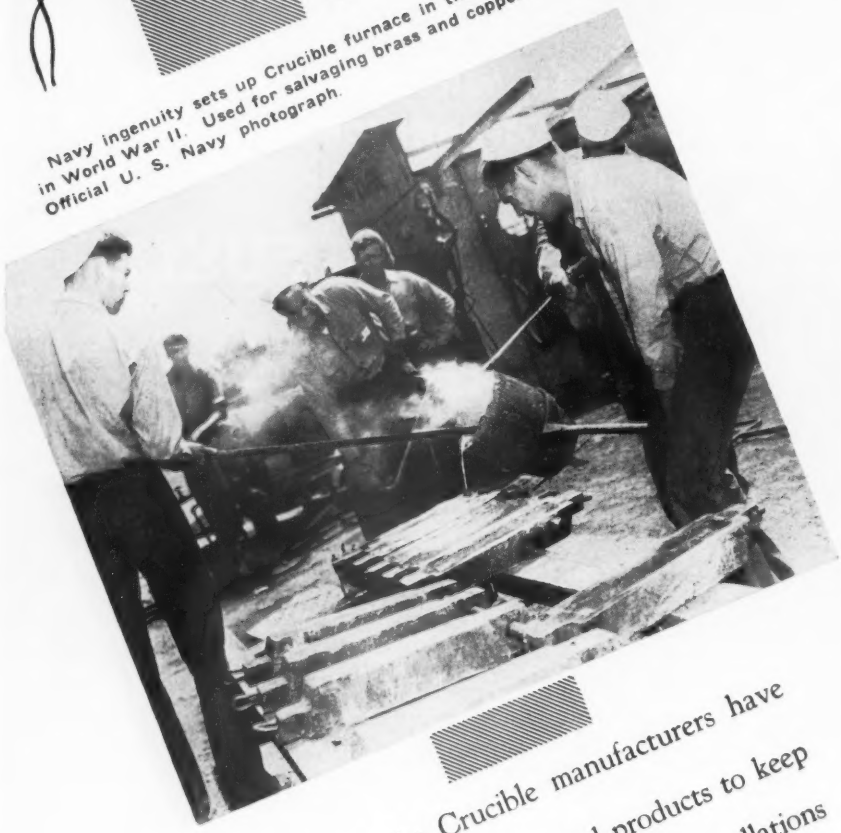

Navy ingenuity sets up Crucible furnace in the field in World War II. Used for salvaging brass and copper. Official U. S. Navy photograph.

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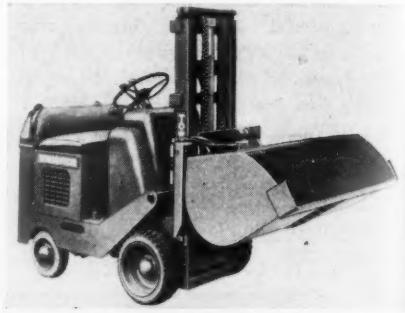
are available with either pendant rope control or push-button control on pendant cable. A transformer in the electrical supply line cuts voltage at the control to 110 volts.

For More Details Circle No. 20—Page 219

Scoop: Towmotor Corp., Div. 75, 1226 East 152nd St., Cleveland 10 —Hydraulic scoop accessory for use with company fork-lift trucks picks up, transports and dumps bulk materials. Actuated by a two-way hydraulic cylinder, the accessory offers positive, finger-tip control of the scoop angle; with the lift truck's mast in vertical position, the scoop will tip 45 degrees forward for dumping the load and 30 degrees backward for carrying the load. Quick detachable couplings in the hydraulic lines leading to the scoop, and simplified suspension from the fork support shaft, make the accessory interchangeable with standard pallet forks.



For More Details Circle No. 21—Page 219

Impregnating and Bonding: Western Sealant of Rhode Island Inc., 1100 Pontiac Ave., Cranston 10, R. I.—Impregnating and bonding service is offered by the company on a 12-24 hr basis. The pressure-vacuum process utilizes an impregnating and bonding agent developed for eliminating porosity in ferrous and nonferrous castings that have to withstand hydrostatic and aerostatic pressure and for bonding similar and dissimilar materals subject to extreme lateral or internal pressures.

For More Details Circle No. 22—Page 219

Timer: General Electric Co., Schenectady 5, N. Y.—Electronic timer provides automatic control of operation, limit and sequence timing for many industrial processes, including paint spraying, electroplating and heat treating. It is available in three time ranges: 0.06-1.2, 0.6-12, and 6-120 seconds. The timer was designed to fulfill industrial requirements for flexibility of application, accuracy and reliability in operation.

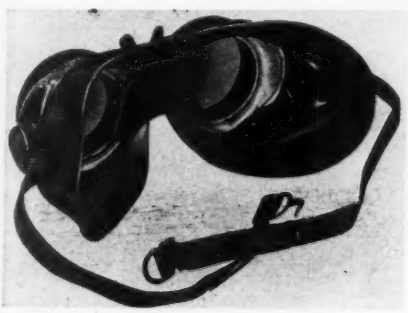
low maintenance and simplicity in servicing. Tests indicate that it can perform a million or more operations at these controlled load requirements: Inrush—15 amp, carry—10 amp, and break—5 amp.

For More Details Circle No. 23—Page 219

Recorder: Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44—New two-pen electronic recorder records two functions simultaneously against time. Both functions are drawn as continuous curves on a 9⅞-in. wide chart. Circuits can be supplied to work with thermocouples, Thermohms, strain gages, tachometers, thermal converters, pH cells, or most other types of primary elements. The instrument can operate controls or alarms. To aid in identification, the instrument draws one curve in red ink, the other in black. Index pointers are red and black to correspond. Any standard single range applicable to the instrument may be selected. The same range can apply to both pens, or the ranges may be different.

For More Details Circle No. 24—Page 219

Goggle Mask: Willson Products Inc., 233 Washington St., Reading, Pa.—Molded rubber detachable padding mask for the company's cover-all safety cup goggles is designed to assure an extra tight fit for protection in welding, chipping, heavy dust, and acid operations. The padding mask is attached to the goggles by a beaded molding which slips over the rims of the eyecups, providing a firm, light-tight joint. It



provides added clearance when goggles are worn over prescription spectacles.

For More Details Circle No. 25—Page 219

Oxygen Unit: Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8—New demand type oxygen unit for emergency treatment of smoke inhalation, heart failure, asthma, pneumonia, and carbon monoxide inhalation is self-contained in a sturdy carrying case. Unit is operated by opening the cyl-

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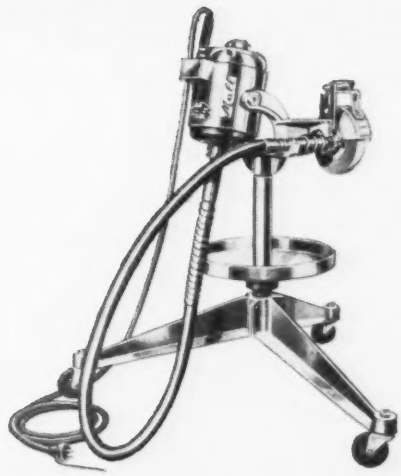

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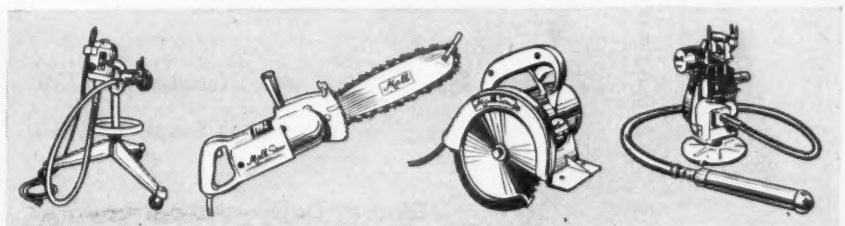

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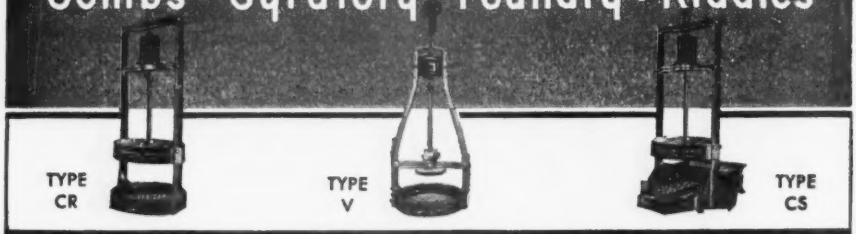

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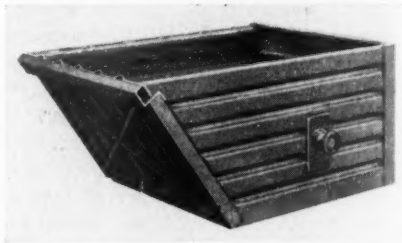
inder valve and placing the facepiece on the patient. Oxygen is administered automatically as the patient's breathing requires it. Complete unit consists of a half-mask facepiece, regulator assembly, 6-ft length of nonkinking breathing hose, a 40 cu in. capacity oxygen cylinder and the carrying case.

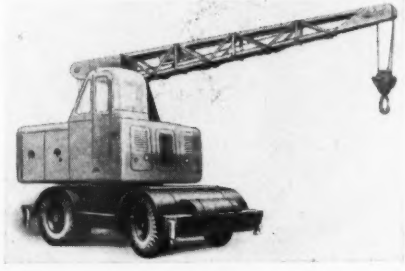
For More Details Circle No. 26—Page 219

Tote Box: Palmer-Shile Co., 16033 Fullerton Ave., Detroit 27—Skip tote box, with trunnions for convenient handling by fork truck or crane, is designed as a scrap metal handler. Box is of corrugated all-steel construction with welded joint. The slanted box end for easy discharge is reinforced with steel braces.



For More Details Circle No. 27—Page 219

Crane: Coles Cranes Inc., 4318 South Paulina St., Chicago 9—New 12-ton self-propelled crane is powered on the gasoline-electric principle, giving a combination of smoothness and precision in operation. Crane is available with either cantilever or strut type boom. It can be supplied with double drums for clamshell operation and with a lifting magnet. A safe load indicator is standard equipment. Boom lengths are available up to 60 ft. Overall dimensions of the crane are 8 ft, 3 in. x 13 ft, 1 in., and tail swing of the superstructure is restricted to 6 ft, 6 in.



For More Details Circle No. 28—Page 219

Labels: Labelon Tape Co., 100 Anderson Ave., Rochester 7, N. Y.—Label tape consists of a special writing surface sandwiched between two layers of acetate. It is supplied in roll form in its own dispenser with built-in cutting edge. Tape may be written upon with pencil or stylus, or

typed upon. It sticks without moistening to metal, plastics, paper, or any other smooth surface material. It is said to be dirtproof, oilproof, smudgeproof, tamperproof, waterproof, acid resistant, and not to yellow with age or dry out and curl. It is available in ⅝, ¾, and 1-in. widths in black, blue, green or red, and in 1½-in. width in blue only.

For More Details Circle No. 29—Page 219

Scale: W. C. Dillon & Co., 1421 South Circle Ave., Forest Park, Ill.—Dial diameter of the company's weight indicator has been increased to 16 in., affording closer readings. Pivots and bearings are polished, hardened, tool steel. Full compensation for tare loads has been provided, and a 360-degree ball bearing swivel hook now is standard. Accuracy is said to be within one division of the indicated reading at any point on the dial. Scale mechanism consists, basically, of a calibrated, tapered steel beam which is deflected by compounded leverages, the resulting beam movement being transmitted to a precision gage movement. Scale is available in capacities from 250 to 20,000 lb.

For More Details Circle No. 30—Page 219

Electric Hammer: Skilsaw Inc., 5033 Elston Ave., Chicago 30—Portable electric hammer with one working part uses a specially designed power unit consisting of two alternately energized magnetic coils. Striking 3600 blows a minute, the hammer will drill and channel in concrete; vibrate concrete forms, and chip, scale, and clean many materials. The hammer has an efficient operating range of ¾ to 1⅛-in. diam star drills. It is 16¼-in. long and weighs 20 lb. Equipment includes a steel carrying case containing a built-in selenium rectifier, 15 ft of rubber covered extension cord, three star drills and other equipment for general use. A complete line of accessories is available.

For More Details Circle No. 31—Page 219

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THEY SAVED

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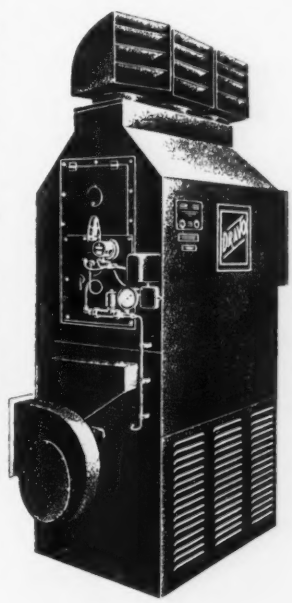

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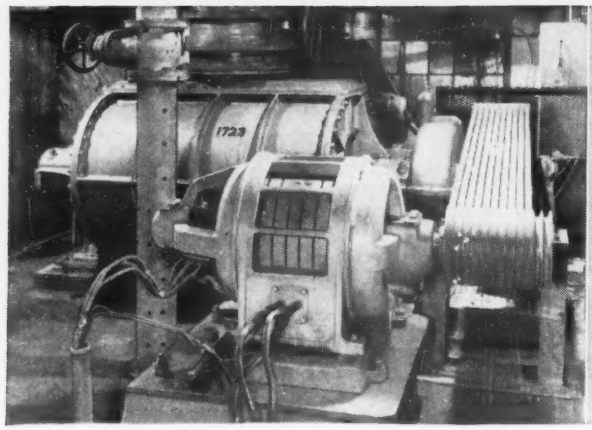

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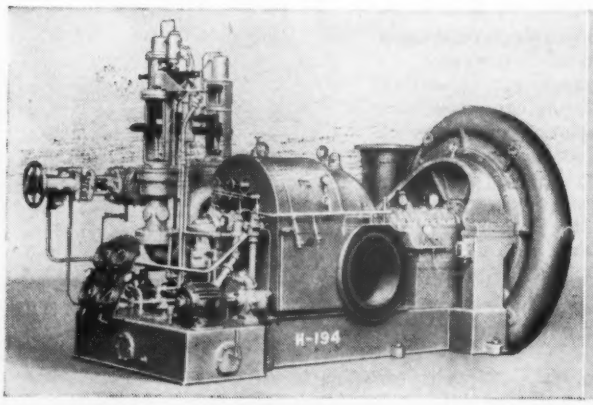

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Steelmaking for Castings

(*Continued from page* 99)

ladles serve fairly well to hold back the small amount of gummy slags that get into them, but with fluid slags they are far from effective.

Fluidity of Converter Steel — The side-blown converter, which until lately has always been lined with acid refractories, and forms an acid slag, also makes very hot, highly fluid steel that runs light castings with ease. Therefore, this process long ago displaced the more expensive crucible method, and at one time most of the light steel castings made in the United States were poured with converter steel. Some 25 years ago, it was displaced in all but a few shops by the acid electric process, partly because of the actual advantage of that method, partly because it was mistakenly supposed and widely reported that converter steel was inferior to both electric and open-hearth steel. Within the past ten years, however, the inferiority of converter steel has been proved to be entirely mythical, and the process has regained a part of the ground it lost to the electric method.

Fluidity of Open-Hearth Steel — Acid open-hearth, like acid electric and side-blown converter steel, also is quite fluid. Basic open-hearth steel, too, is not as sluggish at the same temperature as completely deoxidized basic electric steel. This is no doubt largely because deoxidation of the slag in the basic open-hearth furnace can never be carried as far as in the electric process; in fact, deoxidizing additions to the slag are never made in this country, in operating basic open-hearth furnaces. As already mentioned, however, neither the basic nor the acid open-hearth process will produce steel hot enough for small steel casting manufacture, and in pouring medium weight and heavy work, lack of fluidity is of comparatively little importance.

Dissolved Gases—In making ingots to be rolled into plate and sheet, the deoxidation of the slag is deliberately carried only to such a point that the metal retains a great deal of iron oxide in solution. This reacts vigorously with the carbon of the steel, producing large amounts of carbon monoxide (CO) gas as steel solidifies in the ingot molds. The ingots poured of this metal have a solid skin an inch or so thick, but are honeycombed with gas blow-holes in the layers immediately under the solid portion. The expansion of the ingot due to the liberation of the gas prevents the formation of a pipe, and thus greatly increases the yield of good plate. The deep-seated blow-

holes in the ingots weld up completely in rolling, so that this "rimming" steel, as it is called, rolls into plate and sheet of excellent quality. Were there only some way to eliminate the gas holes, castings might be poured of rimming steel, and would require no sink-heads. For obvious reasons, however, this is quite impossible.

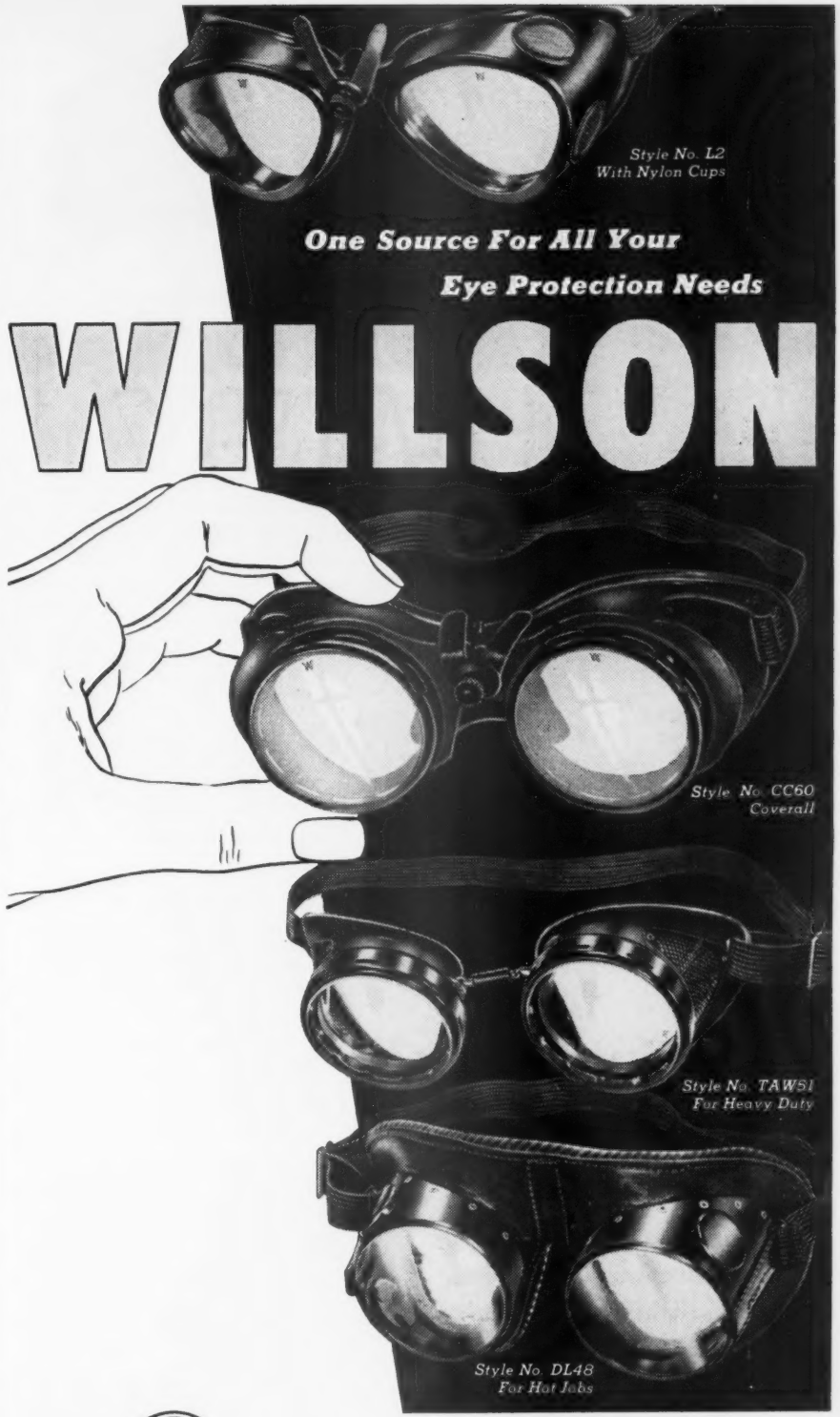
Another grade, known as "semi-killed" steel, is also used to pour ingots. To produce steel of this class, deoxidation is carried much farther than in making rimming steel, but not to completion. Though sound ingots can be made with semi-killed steel, it cannot be used for castings poured in sand molds because it would liberate enough gas in solidifying to produce pinholes in the steel.

Forging ingots of the highest grade are poured only from fully deoxidized, or "dead-melted," steel, which tends to "pipe" very deeply. The ingots are cast in "big-end-up" molds provided with a refractory-lined "hot-top," so that directional solidification from the bottom up is attained, and the slowly cooling sink head provides the necessary metal to make the ingot perfectly solid. In the old-fashioned "big-end-down" molds, without hot tops, as much as 60 per cent of the upper portion of an ingot of dead-melted steel would sometimes be "piped" and discarded at the rolling mill.

Because it is necessary to prevent the formation of any gas holes whatever in steel castings, only fully killed steel is used in steel foundries. In castings, as in ingots, this steel tends to form shrinkage cavities, and their formation must be prevented by the various methods described in the sections on heading and gating.

Hot Tearing—Ingots are purposely shaped so as to minimize the tendency to form hot-tears, and these defects usually are confined to the corners of the ingots, and are of relatively minor importance. Hot tears in steel castings, on the other hand, quite often assume serious proportions, and the foundryman is constantly under the necessity of guarding against their formation. They are caused by the failure of the steel to yield, without tearing apart, to tensile stresses set up in the casting as it contracts on cooling. Hot tears form at temperatures a little below the solidification point of the steel when its strength and ductility are very low, and usually are found at places in the casting where concentrations of stress occur.

The causes of these local stress concentrations will be discussed elsewhere. At this point it is enough to state that they occur and that the



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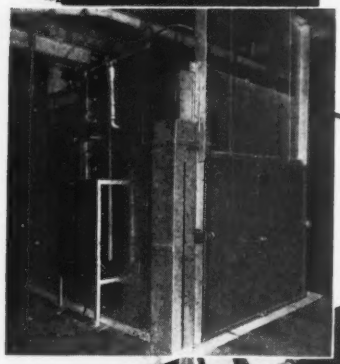

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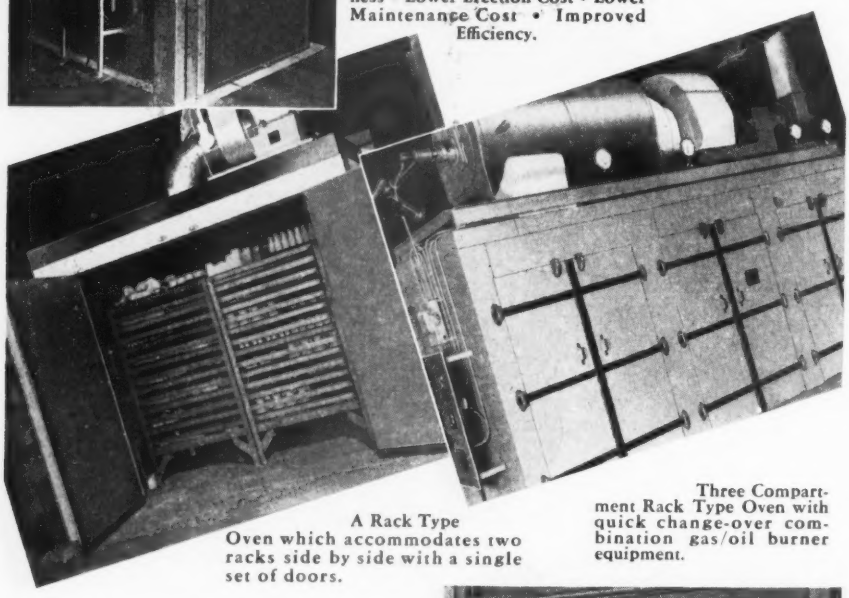

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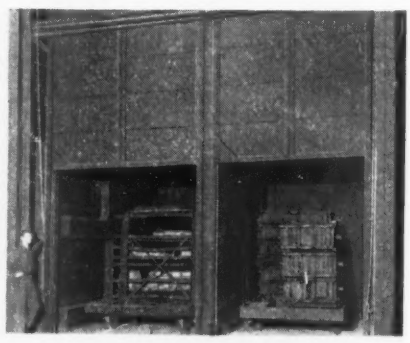

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steel sometimes is able to yield to them without pulling apart, and at other times fails to a greater or less extent. If failure does not occur, of course, the steel at the point of local stress concentration is "virtually expanded," that is it cools without loss of length, by the yielding of its particles, and when cold is longer than it would have been had it been free to contract.

The information as to the variations in strength and ductility of different steels at temperatures close to their melting point is rather meager so that it is impossible to draw really accurate conclusions as to the influence of such factors as carbon content, for instance, on the tendency to hot tear formation. Briggs[1] believes that the type of nonmetallic inclusions present in the steel has an influence, and that the presence of certain types of inclusions increases the tendency of the steel to tear. The inclusion type has always been determined by examination of the steel at room temperature, however, and it is by no means certain that immediately after solidification the inclusions are of the same shape and nature that they are after cooling is complete.

Steel Breaks in Mill

The well known fact that bessemer steel that has not been deoxidized at all, will break up in the mill if an attempt is made to roll it, is probably an indication that inclusion type has an influence on the strength of steel at high temperatures. It is probable, therefore, that imperfectly deoxidized cast steel would be more apt to form hot tears than the metal normally poured into castings, but as neither rimming nor semi-killed steel can be used in foundries, speculation on this head is chiefly of academic interest.

It appears to be true, however, the tendency of steel to hot-tear in castings increases almost in exact proportion to its sulphur content. Hall[2] has shown that the strength and ductility of steel at temperatures close to its melting point decrease rapidly as the sulphur content is increased, which, of course, would indicate that the higher the sulphur the greater the tendency of the steel to hot tear. Certainly this is true of the steel made in any one shop, by a particular steelmaking method. With basic open-hearth steel, for instance, castings of very light section but large area regularly are produced with relatively minor amounts of hot tearing, so long as the proportion of sulphur does not exceed the proper limit. Let an off-analysis heat be made, with sulphur above the speci-

fied percentage, however, and these defects will appear in castings in which they do not usually form, while the size of the tears in castings normally containing them all will be very greatly increased.

It is not known with certainty, however, whether the process by which the steel is made has an influence on its tendency to hot tear at any given sulphur level. Obviously, the basic processes, in which sulphur can be in part eliminated from the steel, enable the foundryman to keep his sulphur level lower than is possible in acid electric or acid open-hearth practice. Other things being equal, therefore, basic steel (electric or open-hearth) should be less liable to hot tear formation than acid steel. It is not definitely known, however, whether at any given sulphur percentage, such for example as 0.04 or 0.05 per cent acid and basic steel are equally susceptible.

Sulphur Causes Hot Tears

As stated previously, it is a fact that when using basic open-hearth steel, certain castings will tear badly when the sulphur is from 0.035 to 0.04 per cent, or above, and will show almost no hot tears if it is below 0.02 per cent, but acid open-hearth men are inclined to believe that at 0.04 per cent sulphur their steel does not tear as badly as basic open-hearth steel of the same composition. However, it is noticeable that most shops making light-section castings that are prone to hot tear, such as freight car sideframes and bolsters, use basic furnaces. Acid steel, however, is successfully used for this purpose in several foundries.

In general, there is no doubt that the sulphur content should be kept as low as possible, not because of its effect upon the ordinary mechanical properties of the castings, but because of its influence on the tendency to hot tear. Either basic open-hearth or basic electric furnace steel can be made readily with very low sulphur content, but in acid electric practice, the sulphur can be kept to low percentages only by using very low sulphur raw materials.

With the converter, in which high sulphur was formerly a bugbear, the addition of fused soda ash to the metal tapped from the cupola now enables the steelmaker to keep the sulphur as low as in any other process. Since the adoption of this method of eliminating sulphur from the metal, the converter has enjoyed a certain advantage over the acid electric furnace for the production of castings in which the tendency to hot tearing is pronounced. The other acid process, open-hearth and elec-

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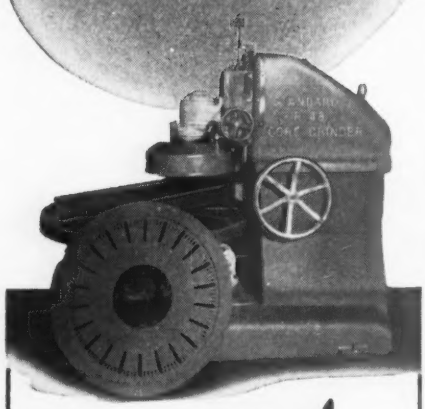

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tric are the least well suited to the production of steel with very low sulphur content.

Effect of Tin — In the past few years it has been difficult in some districts to obtain enough low-phosphorus steel scrap of satisfactory size to operate acid electric furnaces. In the effort to secure adequate supplies of scrap, a great deal of bundled sheet metal has been purchased, and inevitably various amounts of tinned sheet have found their way into these bales. Tin can be removed from tinplate only by treating it with chlorine gas and dissolving the stannous chloride so produced in water solutions (the Vulcan de-tinning method). Heating the sheet in furnaces does not remove the tin, and rusty tin plate still retains practically all the tin of its original coating. In melting tinplate in the furnace, all the tin present on the scrap goes into the steel.

The literature does not yet give a satisfactory answer to the question of the effect of dissolved tin on the tendency of steel to hot tear in castings, or to break up in the mill, when rolling ingots. Some rolling mills report that they have encountered no difficulty in handling steel ingots with tin contents that other mills found to give serious trouble. The steel foundries, too, have not yet reported definitely on the subject.

However, experience in some plants has shown that extremely serious hot tears are formed in steel castings when the tin content is as high as 0.04 per cent, while castings from the same patterns are quite free from these defects if the tin is kept below some 0.035 per cent. Some of the worst instances of severe hot tearing to come to the notice of the author were found to be caused by high tin content in the steel. The exact percentage of tin that causes difficulty probably varies somewhat with the content of other elements and perhaps with the steelmaking process used, but the steel foundryman who encounters difficulty from hot tearing always would be well advised to look into the matter of the tin content of his metal, as well as that of the more usual elements. To make the matter more vexatious, the analysis for tin is rather difficult to carry out, and to be certain of accurate results it is necessary to check with a thoroughly competent analytical laboratory.

Off-analysis Heat—When the rolling mill man makes an "off-analysis" heat, he can generally hold the ingots in stock until he secures an order that will permit him to use them. The foundryman, on the other hand, frequently takes orders for castings of certain patterns, which must meet his customer's specifications for mechanical properties and analysis. If a heat of steel is made that differs markedly from the customer's requirements, there is often no possible way to use it, so that it must be pigged and scrapped. The chances of having enough molds ready for castings in which the analysis of the steel is unimportant are generally poor, and if the steel is poured into the molds for which it was intended, the castings will not be salable. The penalties of missing the analysis of a heat are far greater in foundries than in rolling mills.

One-turn vs Continuous Operation —To keep operation costs to a minimum, open-hearth furnaces should be run on a continuous, round-the-clock basis, and to a considerable extent the same is true of electric furnaces. When pouring ingots there is no difficulty in taking care of the steel at any hour of the 24, as all that is needed is to wash and set up ingot molds. To have enough molds for castings ready to pour at night is a different matter, and the processes that are most economically operated on a continuous basis are not always easy to fit into the operating schedule of a steel foundry. Generally, it is most convenient and economical to do most of the molding in the daytime, and when many molds must be poured off at night, extra space must be provided on the closing and pouring floor to accommodate the work that cannot be poured on the day turn.

In many parts of the country, too, power charges for electric furnace operation at times of heavy demand are so high that it is advisable to make steel only when "off-peak" rates are obtainable. This may necessitate pouring the entire day's output at night, so that the pouring floor must be large enough to set up all the molds made during the day.

When molding and pouring can be carried out simultaneously, on the other hand, only enough space need be provided to set up the molds that can be poured off with one or two heats, and shaking out may go on at the same time as molding. Fewer flasks are needed to operate in this way, as well as less pouring space. Small heats, coming at short intervals, rather than large ones a couple of times a day, lend themselves best to this method of operation.

The side-blown converter normally produces about three, or at least two, heats per hour, so that it makes steel from three to four times as fast as the acid electric furnace. With a converter of given size, therefore, as much steel can be produced in one turn as an electric furnace of the same capacity makes in 24 hr. In a converter shop, then, molding, pouring and shaking out can be carried on at the same time, and the entire day's output produced on day turn. Not only does this make it unnecessary to take up floor space with molds being held to pour off at night, but the supervisory staff has a much better opportunity to oversee the work of the shop and guard against the errors and mistakes that seem always to occur on the night turn.

(To be continued)

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1. C. W. Briggs, *Metallurgy of Steel Castings*, pp. 332, 333.
2. H. Hall, "The Strength and Ductility of Cast Steel During Cooling from the Liquid State in Sand Molds," Part II, Special Report No. 23, 1938, pp. 73-86, Iron and Steel Institute, London.

Armour Research Issues Annual Report

Armour Research Foundation of Illinois Institute of Technology, 35 West 33rd St., Chicago, has published its annual report for 1949-50 in the form of a booklet entitled, "Research for Industry." Profusely illustrated and extremely modern in typographical form the book describes the foundation's activities in many fields of applied science.

Work is handled by three main divisions — Research, international and magnetic recorder. Some of the research projects undertaken during the year are outlined, technical assistance for economic development of foreign countries is discussed, and activities in the field of magnetic recording of sound are summarized. Balance of the book is devoted to a description of the foundation's special laboratories and research facilities, reproduction of an organization chart and administrative and personnel staff listings.

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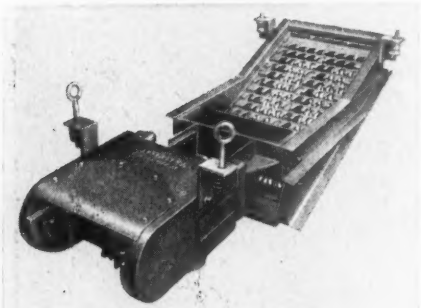

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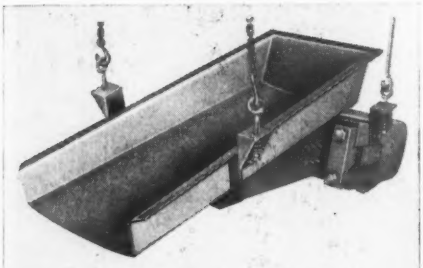

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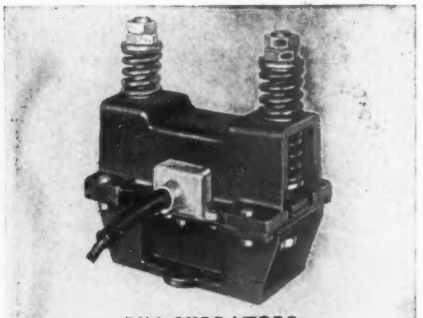

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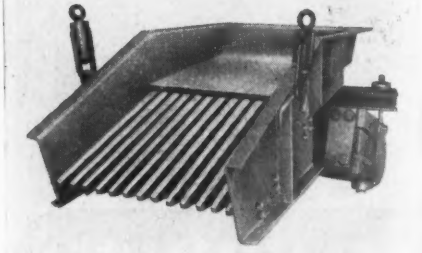

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Use of Pyrometry in the Nonferrous Foundry

(*Continued from page* 89)

balancing. That is, all adjustments are made automatically so that when the pyrometer lance is inserted in the metal the temperature is read quickly on the dial of the potentiometer. If a permanent temperature record is also desired, it is simple to hook up recording pens and graph paper with the potentiometer.

Regardless of whether the millivoltmeter or the potentiometer is used as the indicating end of the circuit, the problem of what to do with the thermocouple junction itself can frequently be difficult. It is possible to use bare wires welded together for the junction or to use bare wires unwelded, which, when immersed in the metal, will allow the metal itself to complete the circuit. In aluminum foundries the use of bare wire chromel-alumel couples has proved quite satisfactory and gives a quick, accurate, temperature reading. Unfortunately, the chromel-alumel wires themselves are subject to changes in calibration by oxidation or by absorption of reducing gases. These changes are not immediately evident to the foundryman who may thus get an inaccurate reading in his pyrometer.

Use Protective Coating

Bare wires cannot be used with the higher temperatures needed in the brass foundry because the thermocouple wires would dissolve rapidly in the bath. For that reason it is usually necessary to protect the thermocouple junction with some material which will permit rapid transfer of heat from the metal to the junction and at the same time will stand up long enough to be economic. A number of different protective materials are on the market and most of them give satisfactory service. It should be pointed out, however, that chromel-alumel couples are not recommended to be used above 2200° F except intermittently. Below 2200° F they will last fairly long, although there is a definite life period to most thermocouple tips and it is usually necessary to replace them after a certain number of immersions in a high-temperature bath.

With both types of equipment it is essential that the thermocouple part of the assembly be checked regularly for accuracy. If this is not done it is possible to obtain faulty readings which, in many respects, will be worse than no reading at all.

The question of whether to use a wall type meter or a lance type pyrometer depends greatly on the particular requirements of the foundry. A lance type meter (Fig. 3) offers considerable flexibility in that it can be carried to any place in the shop with the crucible and temperatures measured right at the mold floor. At the same time it sacrifices accuracy and sensitivity and is subject to damage by being moved around in the foundry. The wall type, (Fig. 4) which is usually a potentiometer, has an attached thermocouple lance which can be moved only to the extent of the lead wire length. It is possible to have long lead wires which give this type of pyrometer greater flexibility or to design a system where the lance can be plugged into lead-ins in various locations in the foundry connected with the potentiometer.

Wall Type Preferred

Original installation cost of the wall type pyrometer is considerably greater than that of the lance type but from the viewpoint of service it will usually do a better job over a longer period. If a permanent record of metal temperature is desired, it is necessary to use the wall type equipment. This is desired in many shops where the management wants to have a record to check against scrap produced.

Another type of pyrometer, either lance or wall type, uses bare wire on spools. In this type the wire is twisted together and immersed in the bath to get a reading. The reading is quite fast and, if done carefully, is satisfactorily accurate. However, the wire usually does not last more than one reading and it is necessary to pull more wire off the spool and retwist the ends to make a junction before using the pyrometer again. This pyrometer has the advantage of giving fast readings; it also prevents the use of faulty thermocouples by burning out before the wire has a chance to become contaminated. Its disadvantage is the additional cost of wire and the necessity for making a new thermocouple junction before each reading.

Use of bare wires gives the fastest readings of any type of thermocouple equipment because whenever a protective covering is used on the wire it necessarily slows down the reaction of the pyrometer to the molten metal temperature. The faster the reading, the more desirable it is in the foundry. The slower readings also have the undesirable effect of being more severe on the protective coverings, which are usually special alloys of

iron and over a period of time are gradually eroded.

How to Use Your Pyrometer—Making accurate, reliable temperature measurements in the foundry requires attention to a number of important details. Both the thermocouple tip and the indicator—either millivoltmeter or potentiometer—must be in good condition. Assuming that the equipment has been cared for and is in working condition, the readings can be made either at a fixed position near the furnace or on the molding floor, depending on whether portable or fixed equipment is used.

There are certain advantages to using a wall-type meter at a fixed temperature measuring station and taking the temperature reading after the crucible or ladle has been skimmed and is on the floor, before being carried to the molds. Having a meter fixed on the wall gives an advantage in reading the dial as well as in keeping the indicator in good working order. Employing a fixed temperature measuring station offers the disadvantage that the time elapsed from measuring the temperature to pouring the molds may vary greatly as different molding floors are poured off. This means that the temperature drop may not be consistent and that the temperature of the metal going into the mold will vary from that of the metal when measured. This can be overcome by establishing working temperature ranges for pouring off the work in the shop.

Using the portable type pyrometer and measuring the temperature just prior to pouring the molds is probably more accurate as a method of control; however, the pyrometer must be in good condition. Also, the small dial on the millivoltmeter of some portable pyrometers requires care for accurate readings. It is a matter of understanding these problems and taking them into consideration that gives the best results with portable equipment.

Using a bare-end couple without a junction requires that the molten metal close the circuit. The most reliable readings on this type of couple are obtained when the thermocouple tip is immersed in the metal 2 or 3 in., kept there for a few seconds and then withdrawn until only about ½ to 1 inch is left in the metal. This technique overcomes the slag effect on the top of the metal and also the fact that, otherwise, the metal temperature would be that of the top surface rather than of the underlying bath.

Using the closed-tip thermocouples requires penetrating any slag or dross on the top of the bath so that

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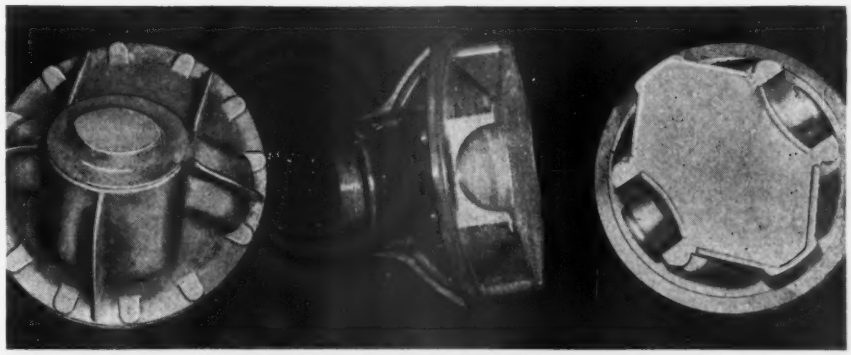
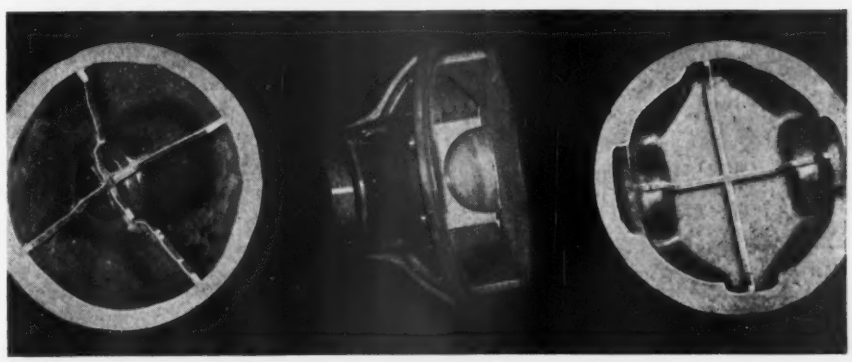
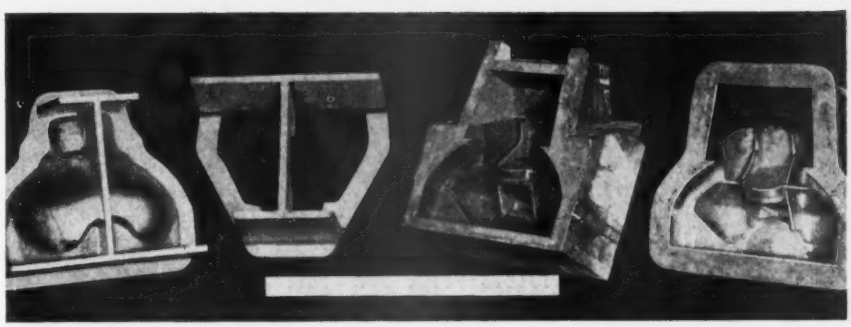


Photo shows face of pattern castings made from master pattern shown in center.



Pattern castings, showing method of lightening out.



Core box casting made from solid wood master core box, showing backing frame and method of backing off

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the tip of the pyrometer is immersed at least an inch or two into the liquid metal. Since these pyrometers are slower acting it may be necessary to keep them in the metal as much as 1 to 1½ minutes until the pointer or the meter comes to rest. If the reading is erratic or the pointer jumps around it can be an indication that the thermocouple has broken or that there is a loose connection in the circuit. An efficient thermocouple should give a continuous reading up to the temperature and hold it at that point.

To reduce the time needed to get a reading, and also to reduce the thermal shock on both the thermocouple and the protective sheath, it may be desirable to preheat the pyrometer tip before putting it in the metal bath. If greater life of thermocouple is desired, preheating will undoubtedly help increase the service life of base metal couple tips.

It is best to insert the couple into the metal in the center of the crucible or ladle rather than at the edges. Immersion should be only about half the depth of the protected end. Inserting it too far into the metal usually means that the junction area may be overheated or that the tube immediately in back of the protection tube may burn out. Since the protection tube is designed to stand high temperatures and the remainder of the couple is usually carbon steel, it is best to use only the protection tube in the molten metal in order to increase the life of the overall unit.

Thermocouple protection tubes with chromel-alumel wire as an integral part of the tube can be purchased in a number of lengths to take care of almost all requirements. Use of a 10 or 12 in. tube offers greater protection for the tube but, of course, is somewhat more expensive initially.

Care of the Pyrometer—It should be remembered at all times that pyrometers are sensitive instruments and can stand very little abuse. Manufacturers make them as rugged as they can to stand up in normal foundry usage. However, that does not guarantee against abuse since they are very easily put out of order, and while they apparently operate, they may give erroneous readings. Needless to say, dropping on the floor or dropping metal on the case or giving the meter case a sharp blow does not preserve the useful life of the instrument.

With the wall-type meter only the lance part of the pyrometer must be given special care. After using it is wise to hang the pyrometer in some bracket designed for the purpose so that it is out of the way and reasonably well protected. When the pyrometer has been removed from the metal and the tip is quite hot, it can stand little shock; at that stage it is most important to handle it carefully. It is possible to arrange a counterweight so that pyrometer lance is hung from the ceiling, drawn down and used whenever necessary and released after use to return to its overhead position. Such a system, of course, requires a fixed position for a temperature reading.

After the pyrometer has been used and withdrawn from molten metal it is essential to clean promptly the thermocouple tip of slag and attached metal. This can be done by using either a wire brush or scraping with a steel bar. Another method highly recommended and convenient is to insert the thermocouple tip into a bucket of dry sand after use; plunging it up and down several times usually will clean off the dross and slag. This also has the advantage of cooling the tip more slowly than if it is allowed to stand in air. A slow cool is desirable to reduce the danger of thermal shock.

Protect the Tip

Further protection of the thermocouple tip can be obtained by coating it before use. This reduces the erosive action of the metal on the protection tube but has the disadvantage of retarding heat transfer, making for a slower reading. Any insulating material will naturally increase the time it takes for the thermocouple tip to come to the bath temperature. It may be worthwhile however, to use coating as a method of reducing the cost of tip replacement. A number of coatings can be used, including a fire clay slurry, core coating material—providing it will adhere suitably to the thermocouple—and a number of proprietary mold coating materials used in permanent mold foundries. Any material which will stick to the tube and not wear off quickly would be suitable.

Checking the thermocouple tip for calibration is essential. Normally, thermocouples are checked by using pure metals and measuring melting points or freezing points and thereby making a calibration curve. This is not too convenient for the average foundry. One helpful technique is to check a new thermocouple tip against a used one in the same metal bath, interchanging them rapidly. This is on the assumption, of course, that one of the thermocouple tips is reliable. Some foundries check incoming shipments of thermocouple tips in an oven, reading them all at the

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same temperature and noting deviations. Usually they will be quite close and can be assumed to be satisfactorily accurate. Use of an oven to check old tips against new ones is also a very desirable method. Regardless of how it is done all thermocouple tips should be checked occasionally to make certain that the readings obtained with them are reliable.

One last word on the care of millivoltmeters and potentiometers. Millivoltmeters are fairly rugged instruments that will stand normal usage but are easily knocked out of calibration by dropping or other shock. It is essential, too, that the case be tightly sealed to keep dust from the inside part of the meter. It is a good practice to occasionally return the indicator part of the pyrometer to the manufacturer for checking and cleaning. A potentiometer is usually hung on the wall and is less subject to rough usage. On the other hand, it is essential that the case be kept tightly closed and no dust allowed to filter through to the mechanism. The dry cell in the potentiometer must be changed regularly as it weakens, and it is good practice to have the standard cell checked once or twice a year to see that it is also in good working order.

Since all pyrometric equipment represents an expense, it is good economy to maintain it in best working order. Additionally, of course, the foundry desiring to control pouring temperatures accurately can do so only with well maintained instruments.

Electric Industrial Truck Group Elects Officers

Electric Industrial Truck Association, Philadelphia, elected officers for 1951 at the association's recent annual meeting. They are: C. B. Cook, Elwell-Parker Electric Co., Cleveland, president, and Elmer F. Twyman, Philadelphia Division, Yale & Towne Mfg. Co., vice president. William Van C. Brandt, association managing director, was re-elected secretary-treasurer.

In addition to Messrs. Cook and Twyman, members of the association's executive committee are: J. A. Baldinger, Philadelphia Division, Yale & Towne; Gordon J. Berry, Electric Products Co., Cleveland, and M. W. Heinritz, Gould-National Batteries Inc., Trenton, N. J.

Announcement was made that Clark Equipment Co., Battle Creek, Mich., has been admitted to membership in the association.

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Company Mobilization

(*Continued from page* 107)

should be used not only to establish the minimum requirements of personnel for effective operation, but should be used also to educate the Armed Forces and superagencies on the fundamentally important problem of the optimum use of manpower.

We suffered strains in using our economy and manpower effectively in past wars. A future war will develop problems as the result of bombing and damage to our plants and loss of life that will be incomparably greater and more difficult to solve than anything in the past. A top agency will have to determine what portion of our population should be assigned to military mobilization and what portion should be retained for economic mobilization. The industrial mobilization plan prepared by each manufacturing plant must, therefore, examine most carefully the key men in mangement and in the supervisory and operational forces so that the views of industry can be thoroughly known prior to the upheaval that would follow our entrance into a major war.

Men Misplaced

Too frequently, as I know from my own experience in the Chicago Ordnance District, men were withdrawn from key jobs in industry as the result of the operation of the Selective Service Act, and after assignment to the military forces were used in unimportant and nonessential military duties. Each company plan might well establish a system of priorities, say by assigning a rating to each individual in a company organization, which would represent the degree of importance the company attaches to that individual in the effective functioning of the organization. No opportunity should be lost to communicate these views to proper authorities whenever the occasion arises.

There is little probability of accomplishing the desired results in company mobilization planning unless top management believes in it thoroughly, sets up a specific organization to accomplish it and, subsequently, by constant and frequent checking of results sees to it that the planning is not only completed in the form of a satisfactory report but that it is kept up to date by periodic review. To this end I recommend for each company an Industrial Mobilization Steering Committee to supervise the progress of the program as it develops.

The responsibility for preparing the plan according to the master schedule established by the Steering Committee is delegated to the plant managers, who are assisted by an industrial mobilization representative on their staffs. I cannot emphasize too much that mobilization planning is a duty that every American citizen owes to his country, but it is likewise a useful and valuable analysis. Taking stock of the resources of a company in men and material things is as valuable as keeping the inventory of raw materials.

Advantage should be taken in planning for mobilization to make a careful and objective analysis of the past in preparation for the future. There has long been a need for plant histories that analyze the experience of the late war. Not only the good features should be recorded, but there should also be reference to the errors and bottlenecks, both in material and in personnel, that hampered war production. One of the great advantages of planning now is that this historical review can, in most cases, be made by men who did the job and who now have a better perspective of the achievements as well as the failures of their administration. These histories, to be of value, must be frank and factual and, since leaders who guided these operations are rapidly retiring or disappearing from the scene, such historical analyses should not be delayed.

Publish Available Literature

As we look to the future we must be careful to include in company mobilization planning everything that can reasonably be published concerning technological advances as the result of the work of research departments or which have developed as the result of process and product improvements. It has always seemed to me that this is one field in which something constructive can and should be accomplished. Some central office should be set up in the military establishment to which industry could report technological progress at the earliest possible moment. If this were done, such information could be classified and disseminated to the interested services where it might prove to be of the utmost value. As far as I know, there is not an agency collecting data of this sort and, until such an agency is established, the sole method that occurs to me to bring this to the attention of the Armed Forces is through an adequate description to be included in the company industrial mobilization report.

Each plant should prepare its own survey under the headings shown in the table on page 106.

Where a company operates a num-

ber of plants, it will be advisable to have, in addition to the individual plant studies, an overall company plan supplementing the data in the individual reports.

The preparation of a mobilization study by any industry by no means exhausts the possibilities of effective work for industrial mobilization. In addition to the obvious responsibility for each corporation head to assist industrial mobilization by the kind of analysis described in this paper, he should accept the personal responsibility for additional activities. There are opportunities to co-operate in the work of the American Ordnance Association, the Munitions Board, and the National Security Resources Board through the advisory committee systems. In his own company, a president should realize that anything he does to improve his organization, to make his quality control more effective, to develop and simplify systems and procedures is not only profitable to the stockholders and to the employees but also directly augments the strength of the company for industrial mobilization.

Specifications May Be Severe

Whenever the opportunity is afforded, the company should examine the specifications for military equipment and should not hesitate to call attention to any departures from commercial practice whenever observed. Frequently it is obviously necessary for military specifications to be more severe than corresponding commercial practice, but it seems to me that the burden of proof should be on the Armed Forces to justify such variations.

We may summarize the objectives of company mobilization planning as follows:

1. To assure the maximum degree of preparedness by a company in order that it may fulfill its obligations to national security.

2. To determine potential capacity, plant by plant, and for the company as a whole, for war production of military items and essential civilian needs, and to keep these data up to date by such revisions as are required.

3. To be in a position to supply prompt and accurate information at any time to appropriate government agencies on the capacity, equipment, personnel and facilities of the company and its individual plants for war emergency production, in order that those charged with the mobilization of industry may determine the most effective and suitable war load for the company.

4. To help keep those concerned

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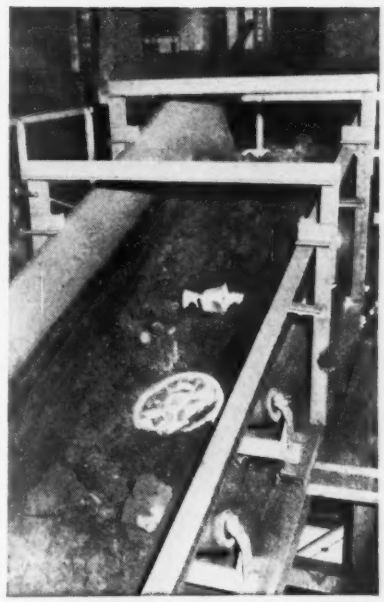

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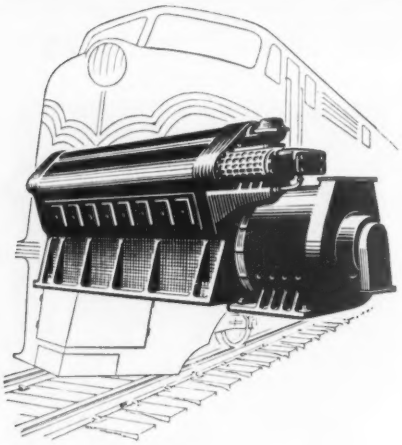

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with industrial mobilization informed on new production techniques and developments in this company.

5. To help keep the company informed on new material developments and changing requirements of the Armed Services.

6. To keep the company and plant management conscious of its duty to the nation.

The title of this paper should be carefully noted. The essential word is "planning" because the product is only semifinished material that does not and cannot, under present conditions, be called a "plan." What it does provide is the maximum that *can* be accomplished until the Army, Navy, or Air Force assigns a specific undertaking to a plant. Whenever that is done, then a real production study can be prepared that will go into details for the particular item concerned; and that will deserve the designation "plan."

Provide Information

Nevertheless, planning results in a most essential basis for a successful industrial mobilization. It provides the information that had to be dug up by procurement planning officers in the years prior to World War II by dint of hard work and as a result of personal inspection and study of each plant. In those years, as a result of energetic activity on the part of the successive executive officers, the Chicago District had in its files in 1940 the essential information concerning approximately eleven hundred plants in the seven states of the district. If planning of the sort described in this paper had been performed by industry in these states, it would have been possible to have accumulated data on at least three or four times the number of companies then available. The advantage to the companies themselves is so obvious that it should be a potent argument in favor of the preparation by every manufacturer in the United States of at least a rudimentary plan for his own protection as well as for the good of the country.

In the world of violence in which we live where the problem of national survival is paramount, prevention of war is one of our most important duties. Since war is fundamentally a conflict of two industrial systems, what each individual industry accomplishes in its planning, as indicated above, will materially affect a potential enemy's decision for war or peace. American industry has a unique opportunity and moral obligation in its planning for industrial mobilization that is patently planning to prevent war.

Efficiency of Operation Doubles Foundry Output

(*Continued from page* 95)

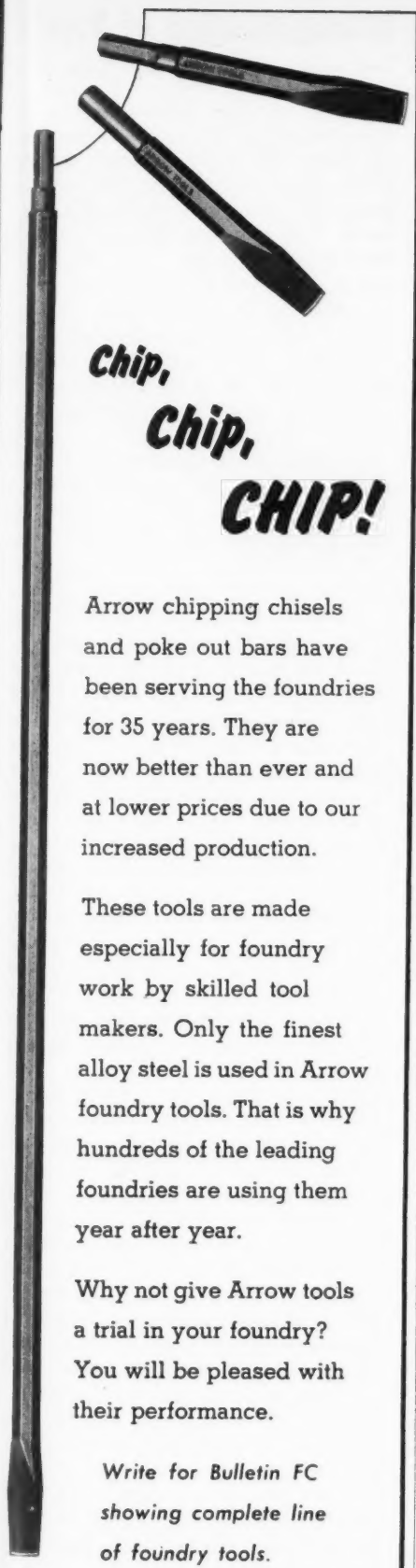
shipped on the next shift to the various Massey-Harris assembly plants. Certain castings which are to be stored outside at the assembly plants before machining are given a protective dip coating of paint.

Supervision and Planning — A foundry which is producing over 100 per cent above its designed capacity and doing this with relatively small amounts of hundreds of different castings requires a high degree of control and close co-operation between members of the supervisory team. Much time is spent in planning and scheduling new jobs before they are put into production. And after they are in production a daily system of reporting and charting forms the basis of front office control to achieve maximum efficiency.

Like a well co-ordinated football team, the supervisory group consists of all men who work under the guidance of a coach—the works manager. They are: Manufacturing supervisor, budget supervisor, production supervisor, comptroller, personnel supervisor, chief inspector, general foreman (days), general foreman (nights), metallurgist, equipment supervisor, and pattern supervisor.

"M" Foundry bids on jobs for its assembly plants just as a jobbing shop. When blueprints on a proposed job are received, a standard company estimate sheet is attached and they are handled in the following manner: The production supervisor outlines the probable equipment to be used in making the casting. This includes types and sizes of flasks and jackets and on which molding line the job will be placed. The manufacturing supervisor specifies the molding method, gating and risering, whether or not facings will be used, and the coring. The proper type of iron is recommended by the metallurgist. The chief inspector outlines the necessary cleaning operations and specifies gaging operations if required. Then the cost is computed and a selling price set.

The blueprints with this information attached then are returned to the production supervisor who fits the job into the foundry load. That is, he determines if and when the foundry can handle the job. The works manager then gives final approval before the bid is submitted. An indication of the efficiency of "M" Foundry may be found in the fact that it gets business from Massey-Harris assembly plants on a competi-



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tive basis with top-notch Canadian and United States jobbing foundry competition.

If "M" Foundry gets the job, steps are taken to get it into production. The pattern supervisor is called in to plan the patterns, if they are not furnished, and work on them is begun. If equipment such as flasks, jackets and bottom boards is needed, it is ordered. Trial castings then are made by hand in the experimental shop and, if these are satisfactory, a trial run is made on the line. Sample castings are submitted to the customer for approval before the job is put into production.

Efficiency Records—Continous efficiency charts are kept on the plant operation. The principal factor in efficiency calculations is the output of workmen. Normal performance of productive employees is considered as 127 to 132 per cent, and all employees are on an incentive plan. The base pay rate of 100 per cent is computed by multiplying an allowance of so much money per piece by the number of pieces that a competent worker can turn out in an 8-hour shift. The incentive plan, of course, permits workers to increase their earnings by turning out more pieces than would be required for the normal 127-132 per cent of base rate. In addition, workers receive an hourly bonus for every hour they work as an increased cost of living factor.

Bonuses also are paid to supervisors for meeting or bettering the budget set up for normal operation of their departments.

Each department operates on a closely controlled budget based on a fairly estimated cost of operation plus allowances for unforeseeable expenses. A number of daily report forms, which provide a measure of activity, show a department's status with relation to its budget. Information from these reports is tabulated and incorporated in the overall efficiency chart. Thus at all times the efficiency chart provides a current picture of departmental activity and will indicate any necessary steps to be taken to prevent a department from getting too far away from good budget control operation.

The daily manpower report shows the budgeted number of employees for each job, the number hired to do the job, and the number who actually show up for work. The daily molding report shows the job number, number of pieces made and those rejected as scrap. The daily scrap report specifies items chargeable and those not chargeable to each worker. Chargeable items cover those defects trace-

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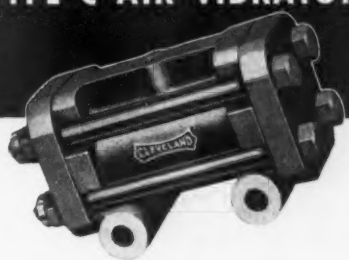

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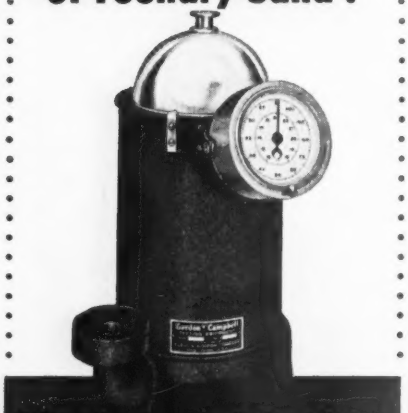

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Sand Mixer For thorough preparation of sample core-sand mixtures.

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able directly to poor work by the molder, pourer or shakeout man, and are deducted from the responsible man's piecework production record.

A daily scrap meeting is held to analyze scrap castings found by inspection at "M" Foundry and those returned from the assembly plants, where defects are detected after machining or other operations. Those attending the scrap meeting include the chief inspector, general foreman (day or night), cleaning room supervisor, coreroom foreman, pattern shop supervisor, trouble shooters, and the manufacturing supervisor. Suggestions are made at these meetings on corrective measures necessary to reduce the scrap and the proper action is instituted.

A daily report on cleaning room activities is based upon the number of tote box loads of castings on hand at the end of a shift. Experience has shown that the cleaning room can accommodate a certain number of tote boxes and still maintain efficient cleaning operations. When the count gets above this number there is danger of a bottleneck and immediate corrective steps are taken.

The plant has an excellent staff of maintenance personnel operating under the direction of the equipment supervisor. He is responsible for keeping downtime to a minimum and for installing new and rearranging existing equipment. A daily downtime record indicates downtime of 15 minutes or more, the reason for the lost production time, and the department in which it occurred.

Quality Control—To maintain high standards of quality in the castings shipped to customers, "M" Foundry applies statistical quality control. This inspection method has proved economical and is in keeping with the company's desire to furnish quality castings on an economical and efficient basis.

Book Review

Chemical Formulary, Vol. IX, by H. Bennett, cloth, 648 pages, 5½ x 8½ in., published by Chemical Publishing Co., Brooklyn, N. Y. Price $7.

Thousands of industrial formulas and methods of their formulation are listed in this volume. No formulas listed in previous volumes are repeated. A chapter on metals and their treatment includes formulas for fluxes; solders; electrodes; alloys; etching compounds; core oils, binders, and coatings; mold coatings, and facing sands. Discussions cover precision casting, quenching and tempering baths, nitriding, metal surface treatments, and plating methods.

Homogenization of Steels

(*Continued from page* 105)

sponsible for the ineffectiveness of homogenization heat treatments, for the diffusion rates of alloys are so much lower than that of carbon. The rates of diffusion of manganese, nickel, molybdenum, and carbon at 2190°F (1200°C) are given in Table V.

According to these values, carbon diffuses about 9000 times faster than manganese, and 20,000 times faster than nickel, with molybdenum occupying a position intermediate between manganese and nickel. It is not unusual, therefore, that cast alloy steels would respond much less favorably to heat treatments intended for homogenization than plain carbon cast steels.

Sensitive to Temperature

The diffusion process is quite sensitive to temperature, the diffusion rate increasing exponentially with temperature. This is usually indicated graphically by plotting the logarithm of the diffusion rate against the inverse of the absolute temperature. But despite this effect of increased temperature, past experience has indicated that above-normal temperatures would be required to effect diffusion of segregated alloying elements. Naturally, time is also important in aiding the diffusion process, but much more can be gained from raising the temperature than from using longer holding times.

The amount of substance that diffuses is proportional to the concentration gradient; the higher the concentration gradient of alloying elements, the more substance will diffuse in a given time. Increasing the concentration gradient also increases the diffusion coefficient. This coefficient measures the relative diffusibility of substances under similar fixed conditions of test. Wells and Mehl[5, 7] found that the diffusion coefficient of manganese and nickel increased about 125 per cent and 80 per cent, respectively, as the manganese and nickel concentrations in a 0.60 per cent carbon steel were raised from 0 to 60 per cent and 0 to 20 per cent, respectively. These authors also found that the diffusion coefficients of manganese and nickel increased rapidly with an increasing carbon content, a 300 per cent increase in the diffusion coefficient resulting from increases in carbon of 0 to 1.25 per cent and 0 to 1.50 per cent in the respective steels.

In highly alloyed steels where the

segregation, i.e. the concentration differences, is large, the diffusion process should be faster at the start of the homogenization treatments than in low-alloy steels. Furthermore, more of the alloying elements should diffuse into the low-alloy areas of these highly alloyed steels than in similar areas of the low-alloy steels given the same heat treatment. This should result in a more apparent improvement in properties in the high-alloy steels than in the low-alloy steels after a given homogenizing treatment.

Another factor that should not be overlooked in the diffusion process accompanying an homogenization heat treatment is the influence the alloy segregation may have on carbon diffusion. Darken[8], for example, has shown that in a system of more than two components, such as an alloy steel, the gradient determining the diffusion of an element is not its concentration alone, but its "activity" gradient in the particular steel.

Break in Carbon Content

For example, when a silicon-containing steel is welded to a manganese-containing steel of the same carbon content and diffusion in the austenite state is allowed to proceed, the carbon actually diffuses out of the silicon steel into that of the manganese steel, resulting in a sharp break in the carbon content of the weld. This is explained as being caused by a difference in the "activity" of the carbon in the two steels. Carbon will not stay in the silicon steel if it can diffuse into a steel better prepared to retain it. If carried to the ultimate extreme, of course, the alloying elements would also diffuse and hence the carbon would eventually equalize. But in the interim, when carbon diffuses, and the alloy very little if at all, such inequalities in carbon content are possible.

In terms of segregation in cast steel, it is possible that the segregation of an alloy may be sufficient for it to cause the carbon also to remain concentrated in that area rather than to diffuse out into the surrounding austenite. Thus, if, for example, a manganese steel were to exhibit manganese segregation, those areas high in manganese might prefer to hold the associated carbon concentration rather than to allow it to diffuse. The surrounding low-manganese areas, even though lower in carbon would not have the affinity for carbon that the high manganese segregate would; therefore, there would be little tendency for the initial carbon segregation to smooth

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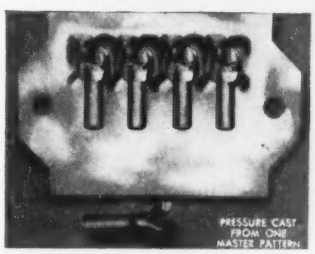

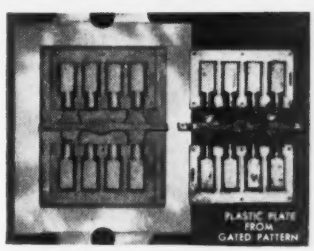

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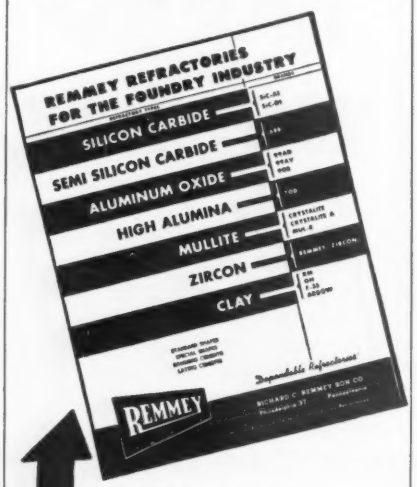

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out even at relatively high homogenization temperatures. As long as alloy segregation persists, there is no guarantee that carbon segregates may not also occur to a degree depending upon the alloying elements used and the extent of their segregation.

If the foregoing analysis, which is based on sound thermodynamic reasoning and evidence, is true, in alloy steels not only alloys segregation, but carbon segregation as well, may persist much longer than generally assumed. Furthermore, it might be expected that the initial carbon content would have a decided influence on the degree of segregation occurring and on the effect of the homogenization heat treatments. A steel of relatively low carbon content has less potential opportunity for segregation because the last liquid to freeze would be lower in carbon than that of a steel having a higher carbon content. It would therefore be expected that the carbon-segregating effects of alloy segregation might be less drastic in this case than in the case of steel of higher carbon content. The result would be that the lower carbon steel would show less beneficial effects from a genuine homogenization heat treatment. This reasoning appears to be supported by the evidence available.

Summary and Conclusions — The property changes of most importance that were affected by homogenizing the three 0.40 per cent carbon-alloy steels were the hardenability, and the yield-tensile ratios. That these effects were not noted by others[3, 4] working with lower carbon materials suggests that the effectiveness of the homogenization heat treatment may be critically related to the carbon content, with steels of higher carbon reacting more favorably to the treatment. For routine, average-size castings such benefits would probably not warrant using the very severe homogenization treatments that are necessary to accomplish appreciable alloy diffusion, but for heavy sections, to be heat treated for maximum toughness and strength, the increased hardenability and better yield-tensile ratios obtained thereby may well warrant such a treatment.

Furthermore, the evidence presented herein that steels of higher alloy content are more adversely affected when cast into heavier sections also indicates that severe homogenization may be worth while for heavy-sectioned alloy steels. Further investigation of this subject, particularly by comparing the heat treatments on cast steels of various carbon contents would aid in establishing the utility of this heat treatment for the cast steel industry.

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Reprint Article Discusses Apprenticeship

"Apprenticeship—What it is and What it Offers," reprinted from *Occupational Trends*, November-December, 1950, explains what apprenticeship is and lists the trades and industries offering the greatest opportunities for young men.

Also explained are the qualifications necessary to be accepted as an apprentice and where to apply; the difference between apprentice training for all-round work in a skilled trade and training for jobs requiring only limited skill; and the importance of apprenticeship in the development of skilled manpower in defense production plants.

Copies can be obtained free from the Bureau of Apprenticeship, U. S. Department of Labor, Washington 25.

Book Review

Why the Taft-Hartley Law, by Irving G. McCann, paper, 288 pages, 5 x 7⅜ in., published by the Committee for Constitutional Government Inc., New York. Price $1.

This book records the history of labor relations from 1935 through January, 1950. In addition to the Taft-Hartley law the book discusses the Wagner Act and the Lesinski bill, presenting factual data on the labor legislation picture.

The author submits evidence of the partnership that exists between the national administration and leaders of great labor monopolies to sabotage the Taft-Hartley law and render it ineffectual through nonenforcement, misinterpretation and maladministration of its provisions. He points to the necessity of remedial action to help preserve freedom of

the American worker and protection of the national welfare. He suggests amendments to the Taft-Hartley law and proposes a plan of organization from the level of the precinct to that of the state to organize, inform and inspire resistance against what he terms a socialistic program fostered by labor monopoly leaders who have dominated policies of the federal government since 1935.

Casting Steel Crankshafts

(*Concluded from page* 87)

hopper of 12 jolt-rollover molding machines, Fig. 1, on the first floor of the foundry. The machines are located in groups of three in front of four vertical, tower core ovens, some of which are shown in Fig. 11. Cores are turned out on plates and placed on racks in the ovens where they undergo a 2-hour baking cycle at about 500° F. The cores are taken off on the opposite side of the oven and set on a conveyor line. The core supports in the line, as may be seen in Fig. 7, are four-arm pedestal type, vertically mounted and free to rotate. As the slab cores move along on the line they are inspected carefully to see that they meet requirements as to surface, contour, straightness, etc. Then they pass to the dipping department, Fig. 7, for application of a silica core wash or coating.

After dipping the cores are placed on the conveyor line which transports them through a horizontal type drying oven where they are baked for about 10 minutes. The cores are inspected again, and then placed on shelf-type racks suspended from an overhead chain conveyor which carries them to storage or to the mold assembly department, Figs. 3 and 12. The former, as may be seen from the floor plan sketch, Fig. 9, is located between the two mold conveyor lines arranged in T-form. Operators stationed along the line in sequence place the various slab cores one on top of the other until the mold is completed.

Proper alignment and location of the slab cores is accomplished by use of V-shape grooves or depressions in the top of one core and similar projections or protuberances on the bottom of the core to be placed on top of it. The cores also are numbered as to sequence. A cast steel top plate is put in position, and then the whole assembly is clamped together with four tie rods, one at each corner. When that is accomplished the molds move into the pouring department to be filled with molten steel.

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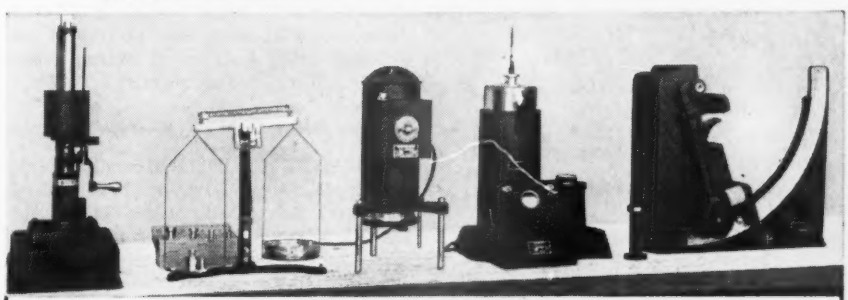

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For More Details Circle No. 90—Page 219

HEAT-TREATING FURNACE: Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44—Catalog section T-623, Sec. 1 describes new furnace equipment which provides full control over temperature and time, and furnace atmosphere in such diverse applications as hardening, annealing, normalizing, carbon restoration, and carburizing to controlled surface carbon content.
For More Details Circle No. 91—Page 219

POWDER CUTTING: Linde Air Products Co., Unit of Union Carbide & Carbon Corp., 30 East 42nd St., New York 17—Reprint, "Powder-Cutting and Scarfing Processes," discusses powder cutting of heavy steel scrap and for nonferrous applications. The chemistry, metallurgy, and equipment used in the process are described.
For More Details Circle No. 92—Page 219

AIR MOTORS: The Bellows Co., 222 West Market St., Akron, O.—Bulletin CL-30 describes the company's air motor and illustrates its use in many industrial applications. Tables list various models available, dimensions of each, and complete operating data. Air device attachments and equipment are pictured and described.
For More Details Circle No. 93—Page 219

ELECTRODES: Harnischfeger Corp., Welding Division, 4400 West National Ave., Milwaukee 14—Bulletin R7-8, pocket size for easy reference, has page tabs marking various classifications of electrodes. Description of each electrode is given, with typical applications and sizes available.
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STORAGE BINS: Neff & Fry Co., 214 Elm St., Camden, O.—Folder describes concrete storage bins for sand, coke, and other flowable materials. Construction details are given and tables show capacities in bushels, cubic feet, and tons in relation to heights and diameters.
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MAINTENANCE: United Laboratories Inc., 16801 Euclid Ave., Cleveland 12 — Maintenance checking chart lists many common building maintenance problems and recommends a solution for each. Included is a list of products and processes for maintenance of floors, roofs, interior and exterior walls, and for other jobs.
For More Details Circle No. 96—Page 219

MATERIALS HANDLING: Lewis-Shepard Products Inc., 258 Walnut St., Watertown 72, Mass.—Bulletin 28 deals with equipment for vertical movement of materials in storage and production operations. Specifications and illustrations cover the company's line of equipment for this purpose.
For More Details Circle No. 97—Page 219

CUT-OFF WHEELS: Abrasive Wheel Dept., Manhattan Rubber Division, Raybestos-Manhattan Inc., Willett St., Passaic, N. J.—Bulletin 6888C lists wheel grade recommendations and cutting performance data, and contains operating suggestions for the Delta cut-off machine.
For More Details Circle No. 98—Page 219

ELECTRIC TOOLS: Buckeye Tools Corp., Division 20, 29 West Apple St., Dayton 1, O.—New catalog features 360 and 180 cycle portable electric tools. Drills, screwdrivers, grinders, sanders, and polishers are illustrated and described, and complete specifications on each tool are included.
For More Details Circle No. 99—Page 219

BATTERIES: Electric Storage Battery Co., Allegheny Ave. and Nineteenth St., Philadelphia 32—Catalog describes performance and utility of storage batteries for materials handling and haulage vehicles. Battery specifications, accessories and miscellaneous parts are listed.
For More Details Circle No. 100—Page 219

COATING: Gates Engineering Co., P. O. Box 1711, Wilmington, Del.—Brochure describes a liquid, air curing neoprene coating for wood, steel, and cement. The brushed or sprayed-on coating is said to have good resistance to abrasion, fumes, acid and oil.
For More Details Circle No. 101—Page 219

MOTOR REDUCER: Falk Corp., 3001 West Canal St., Milwaukee 8—Bulletin covers a right-angle motor reducer used for either horizontal or vertical applications and available with single or double end output shaft.
For More Details Circle No. 102—Page 219

COLLOIDAL GRAPHITE: Acheson Colloids Corp., Port Huron, Mich.—Bulletin 424 deals with lubricants containing colloidal graphite. Uses of the various compounds are discussed, and instructions are given for blending the graphite with different vehicles.
For more Details Circle No. 103—Page 219

TRUCKS: Kilbourne & Jacobs Mfg. Co., Box 177, Columbus 16, O.—Catalog 116 covers company's line

of nonhighway trucks and trailers from light tubular steel bottlers' trucks to heavy freight terminal and stevedore trucks, four and fifth-wheel warehouse trucks, and many custom-designed and custom-built trucks and trailers of up to 50 ton capacity.
For More Details Circle No. 104—Page 219

SAND BLOWER: Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5—Illustrated bulletin CB-2 describes a newly designed all-purpose sand blower for making cores. The various models are pictured and specifications are given.
For More Details Circle No. 105—Page 219

LABORATORY SUPPLIES: Burrell Corp., 2223 Fifth Ave., Pittsburgh 19—Catalog 450 describes laboratory apparatus and supplies. It lists over 25,000 items and includes many improved methods and aids for chemical analysis and testing.
For More Details Circle No. 106—Page 219

METAL SHAPER: Delta Power Tool Division, Rockwell Mfg. Co., 600 East Vienna Ave., Milwaukee 1—Bulletin AD-615 on a 7-in. metal shaper gives specifications, catalog listings, and illustrations of features. Extra equipment also is listed.
For More Details Circle No. 107—Page 219

FERROUS CASTINGS: Belle City Malleable Iron Co., 1442 Forest St., Racine, Wis.—Folder lists the company's ferrous metals, their physical properties, photomicrographs of the metal structure, advantages, and suggested applications.
For More Details Circle No. 108—Page 219

HOISTS: Joy Mfg. Co., Oliver Building, Pittsburgh—Bulletin 76-X describes single drum, multipurpose hoists. Specifications for hoists with capacities from 500 to 3500 lb and driven by air or electric motors, or gasoline engines, are included.
For More Details Circle No. 109—Page 219

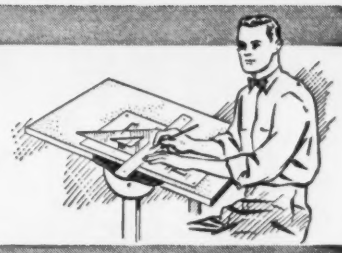
CAR SHAKER: Allis-Chalmers, 1032 South 70th St., Milwaukee 1—Bulletin 07B7221A gives full details and specifications on a car shaker for unloading granular material from hopper-bottom gondola cars.
For More Details Circle No. 110—Page 219

CHAINS: Jeffrey Mfg. Co., 907 North Fourth St., Columbus 16, O.—Catalog A418 covers company's line of chains and sprockets for new and replacement service on elevating and conveying equipment, and for drives.
For More Details Circle No. 111—Page 219

PRECISION CASTINGS: Alloy Precision Castings Co., East 45th St. & Hamilton Ave., Cleveland 14—Illustrated brochure contains data on precision castings produced by the frozen mercury process.
For More Details Circle No. 112—Page 219

PORTABLE CONVEYOR: Barber-Greene Co., 631 West Park Ave., Aurora, Ill.—Illustrated bulletin 362 describes a portable belt conveyor and lists applications and names of users.
For More Details Circle No. 113—Page 219

DESIGNERS AND BUILDERS OF SPECIAL FOUNDRY MACHINES...



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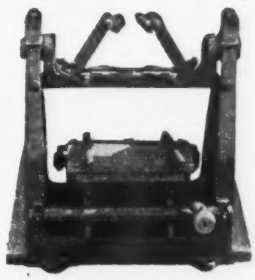

Special Rollover Draw Core Machine

• *for a STEEL foundry—Molding Machines*
This job consisted of 4 special power-rollover-power draw-roll out units for installation on a turn table with sand-slinger operation. For making heavy-duty, steel truck wheel drag molds. Results—extreme accuracy of molds and considerable saving in labor.

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19 special rollover-power draw units for a turn-table set-up. In the OLD arrangement, 6 machines with specially trained operators were used. In the NEW setup, 9 Sutter-designed units were placed in the same floor space and ordinary labor used. Results—production increased.

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LIQUID BINDER

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Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

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(Established 1905)

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(Established 1915)

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INDUSTRIAL COKE

HAMILTON SPRAY GUN

COMPLETE
WITH 4½ FT. SUCTION HOSE
AND SINKER

$10.00

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For spraying molds and cores with any liquid. For cleaning electric motors, gasoline motors and machinery. For laying dust.

Neoprene disc valve. Trigger control. Sturdy brass construction. Length overall 6½". Weight without suction hose and sinker 18 oz. Two nozzle sizes, ⅛" and ¼". Literature on request.

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FIFTH AND VINE STREETS, HAMILTON, OHIO
Moisture Elimination Up To 3000 Pounds Per Square Inch

It's time we got *working* mad!

As we listen to the latest insults from Moscow, we're likely to get fighting mad.

Instead, we'd better use our heads and get *working* mad.

It is clear by now that Stalin and his gang respect just one thing—strength. Behind the Iron Curtain they've been building a huge fighting machine while we were reducing ours. Now we must rebuild our defenses—*fast.*

As things stand today, there is just *one* way to prevent World War III. That is to re-arm—to become strong—and to stay that way!

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We can do this double job if we all work together to turn out more for every hour we work—if we use our ingenuity to step up productivity.

All of us must now make sacrifices for the common good. But we're working for the biggest reward of all —*peace with freedom!*

THE BETTER WE PRODUCE THE STRONGER WE GROW

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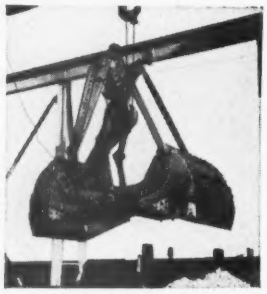
FOUNDRY

These Four BLAW-KNOX *Buckets* Help Solve Your Rehandling Problems

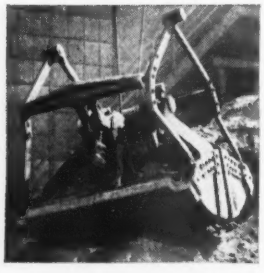
"SHARK TOOTH" Single-Line Hook-On Buckets

HERE'S the answer to the problem of handling coke and sand . . . simply by adding or removing liner plates, the *same* dual purpose Blaw-Knox Bucket handles both, with minimum degradation of coke and without sand leakage! The illustration at the upper right shows an open head type Single-Line Hook-On Bucket, rated 1 cubic yard, with liner plates applied inside of the shark teeth for handling sand, coal, small limestone and granular fines. Illustrated at the right is a closed head type 1 cubic yard Shark Tooth Bucket without liner plates for coke handling.

Blaw-Knox Shark Tooth Buckets are available in a wide range of sizes and for different headroom conditions.



FOR EXTREMELY LOW HEADROOM



THIS Single-Line Hook-On Bucket solves rehandling problems when headroom is extremely limited. The ¾ yd. capacity bucket requires only 6'7" operating headroom. Also available in larger sizes.

FOR AVERAGE OR UNUSUAL CONDITIONS

THERE is a type and size of Blaw-Knox Single-Line Hook-On Foundry Buckets to meet a wide range of operating conditions. Blaw-Knox can best give you the competent engineering service that makes possible selection of the bucket suited to your needs.

Write for Bulletin 2232 today

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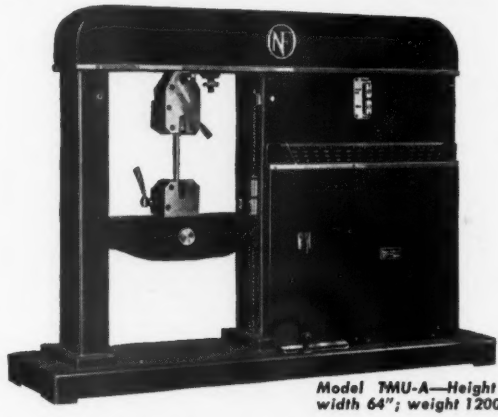
BLAW-KNOX
FOUNDRY BUCKETS

It Will Pay to Make Your Own Tests with NATIONAL FORGE UNIVERSAL TESTING UNITS



Model TMU-A—Height 44"; width 64"; weight 1200 lbs.

The National Forge Universal Testing Machine, Model TMU, is compact, accurate, dependable, easy to operate and moderately-priced.

Wide working clearances, long stroke, quick-action simplified variable-speed control, improved grips and a wide spread of load scale ranges adapt this modern, streamlined unit to production, research or school instruction tests of a great variety of materials and specimen sizes. A.S.T.M. accuracy requirements are guaranteed.

Three load scale ranges: Model TMU-A—0-30,000, 0-6000, 0-600 lbs. Model TMU-B—0-15,000, 0-3000, 0-300 lbs.

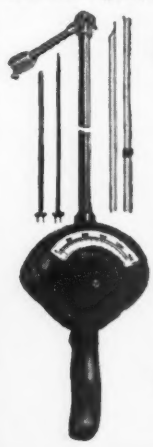
For details, write for Brochure 501.

TESTING MACHINE DIVISION
NATIONAL FORGE & ORDNANCE COMPANY
Dept. F, Irvine, Warren County, Penna.

Measure Foundry Temperatures Accurately . . . at a glance!

Use the Simplified PYRO Optical Pyrometer

Any operator can quickly determine temperatures of minute spots, fast-moving objects and smallest streams with the simplified PYRO Optical Pyrometer. Completely self-contained—no calibration charts or accessories needed. An accurate, DIRECT-READING instrument that will pay for itself many times over by helping prevent spoilage. Weighs just 3 lbs. Available in 5 ranges (1400° to 7500° F.) *Write for FREE CATALOG #80, today!*



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American's own manufacturing process assures uniform hardness and size. All sizes are graded to S. A. E. specifications and packed in 100-pound bags.

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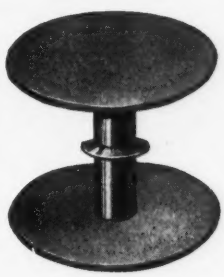
Buffalo *"LEEK-PRUF"* CHAPLETS

In both Double (shown) and Single Head types of "Buffalo" *LEEK-PRUF* Chaplets, the chief factor of efficiency is the exclusive fin design.

Integral with the stem, this extremely thin section protrudes to its full width. There is no recess in the stem to cause weakness. The advantages of this original fin design speak for themselves.



- Positive fusion with molten metal—no chance for leakage.
- Burns in more easily.
- Does not chill molten metal.
- Stem is always full size—hence stronger.

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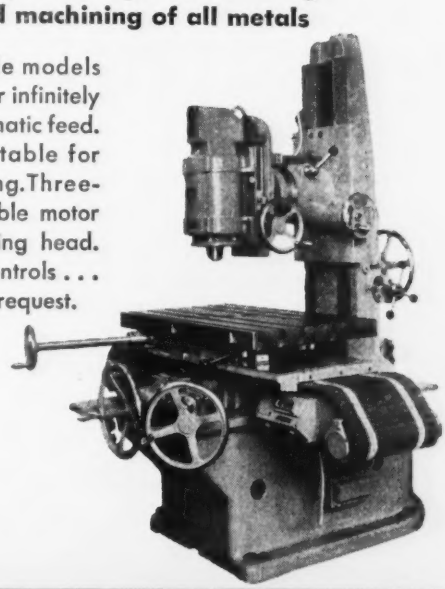
for precision pattern making and machining of all metals

TWO versatile models with manual or infinitely variable automatic feed. Rotary work-table for circular milling. Three-speed, reversible motor serves as milling head. Convenient controls . . . Particulars on request.



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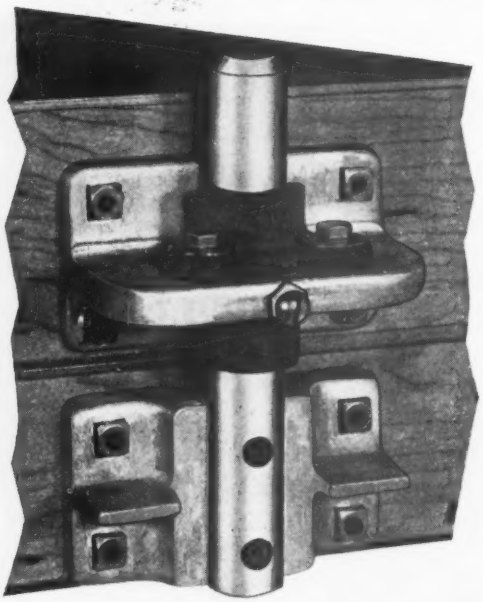
Featuring the

V-G ROUND PIN ASSEMBLY



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HARDENED and RUSTPROOF
DOUBLE LIFE—REVERSIBLE

REMOVE CAP SCREWS AND ROTATE PIN 180 DEGREES.

ALUMINUM PIN BASE AND COPE EAR ADJUSTING SCREW FOR COPE GUIDE

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Shipments can be made promptly

Write for complete information

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Reduce Use of Chills in Gray Iron Casting

Now all you have to do to get hard chilled iron is add

TELLURIUM

Comes in 1, 2, 3 and 4-gram tablets; also in powder, slabs and sticks. For full information, write Dept. LM for 8-page article, "Use of TELLURIUM In Promoting Chills On Gray Iron Castings."

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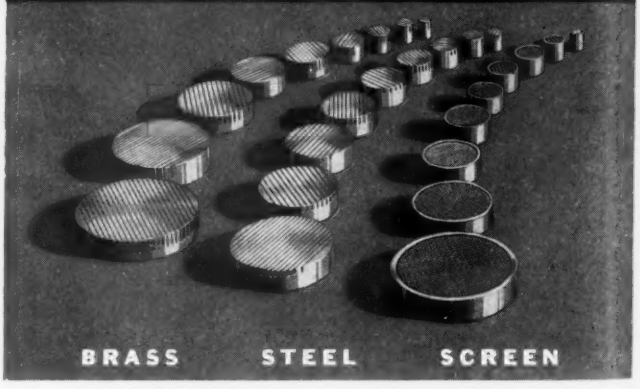
PRECISION CORE BOX VENTS



You can depend on the quality that is built into every Demmler Core Box Vent. All orders are promptly filled from stock.

SLOTTED VENTS
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Slot Widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8" 1", 1 1/4", 1 1/2"

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Mesh: #30, #40, #50
Diameters: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

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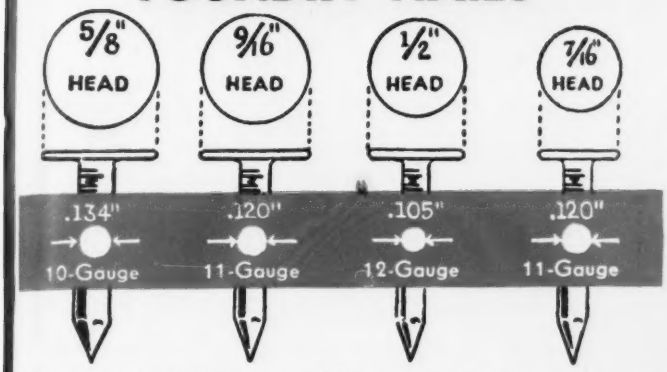

1/8", 9/16" & 1/2" Heads available up to 3 inches in length

Standard Foundry Nails available in all lengths.

All styles of Chaplets Accurately Made for Better Castings

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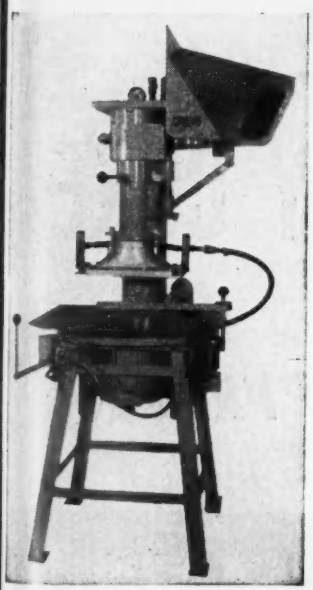

HIGH DRAW MODEL "C-H-E"

Cores up to 8 lbs.

With the operation of one lever on the hand machine, or pushing of one button on the electric cycle, this machine will —Close the Core Box—Blow the Cores—Vibrate the Box—Draw the Cores—and Eject the Core Box to position where the dryer is applied. Produces more cores with less operator fatigue, and more cores per hour.

Let us figure on your requirements.

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A BLAST FURNACE PRODUCT

Smelted from Superior quality lake ores, high grade metallurgical coke and limestone, using our own local No. 1 Sharon Seam coal.

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A "blend" with JISCO is sound metallurgy.

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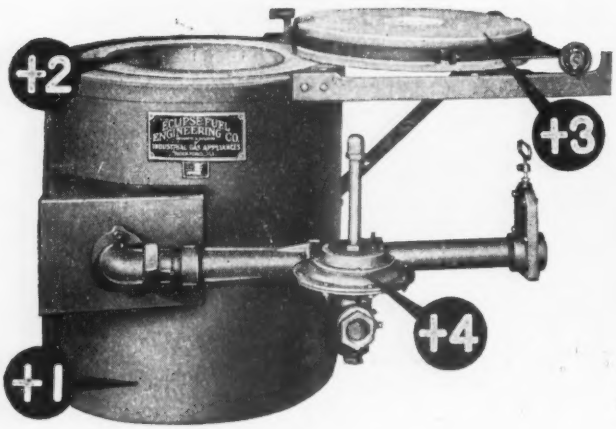
HIGH PRODUCTION MELTING FURNACE with plenty of "PLUS"



ECLIPSE "RB" Crucible Furnace

For heavy foundry production in melting brass, bronze, aluminum and other alloys, this Gas-Fired Eclipse Crucible Furnace meets every requirement—and in addition has many "plus" construction features that make it unusually practical and economical.

+1 **Sturdy Shell Construction:** The furnace shell is heavy sheet steel with welded seams reinforced with flat stock band to eliminate top distortion. Shell bottom is constructed of heavy plate raised off floor to provide proper ventilation under furnace.

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+3 **Cover Construction:** The roll back cover provides a tight-fitting seal between furnace and cover and helps keep floor space to a minimum. Heavy cover frame work and roller rails combine to make a durable cover arrangement.

+4 **Burner and Mixing Equipment:** The burner equipment supplied on this type of equipment consists of a McKee Special Walltite burner designed for high production melting. Proper air-gas ratio adjustment is maintained by using a McKee Low Pressure Proportional Mixer. Regulation of heat imput is easily controlled by the single valve control of mixer.

The Eclipse line of Gas-Fired, Non-Ferrous Metal Melting Furnaces includes a size and type to fit your foundry needs. Write for Bulletin C-2 describing various models of crucible furnaces, with full specifications.

3215MM

Eclipse Fuel Engineering Company
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McKee Eclipse

"OLIVER" Single Surface Planer

Takes stock up to 24" wide 8" thick

A compact efficient Planer for your pattern shop

This precision-built Planer is a favorite in many pattern shops. It feeds at any rate from 18' to 40' a minute at the turn of a dial. Controls centrally located for operator's convenience. Revolving parts enclosed for safety and exclusion of dirt. Built-in knife jointing and grinding rigs. *Ask for Bulletin 299.*

OLIVER MACHINERY COMPANY
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TERRE HAUTE SPECIAL FOUNDRY COKE

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A QUALITY PRODUCT

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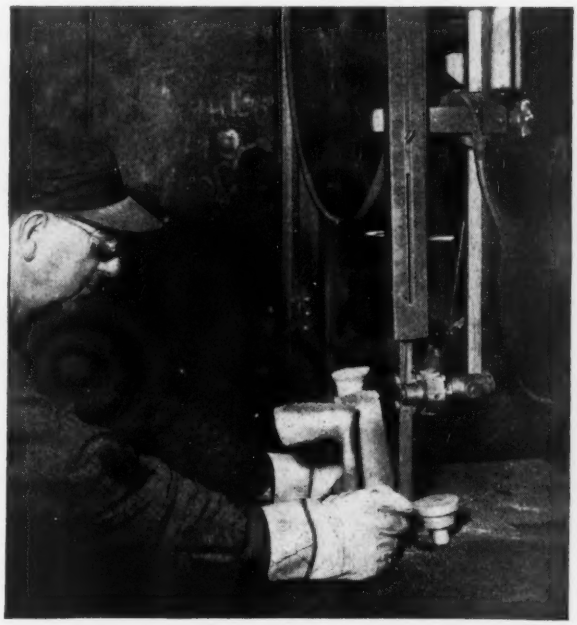
Manufactured at Terre Haute, Indiana, by INDIANA GAS & CHEMICAL CORPORATION

ATLANTIC Band Saws



The Favorite Blades of Non-Ferrous Foundries for Over 20 Years

You will profit by using the tougher Atlantic blades for clean, speedy cutting of gates and risers from castings. You can eliminate unnecessary grinding operations—our specially milled tooth construction makes it easier to cut closer to the body of the casting. All Atlantic Metal Cutting Band Saws are guaranteed as to material, workmanship and temper.

Send for Atlantic Band Saw Catalog,
describing foundry cut-off operations.

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Exclusively Band Saw Production

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BRING RESULTS!

- Do you need a superintendent, foreman, metallurgist, electric furnace man, core room foreman, pattern maker, cupola expert?
- Have you some used equipment which should be turned into cash?
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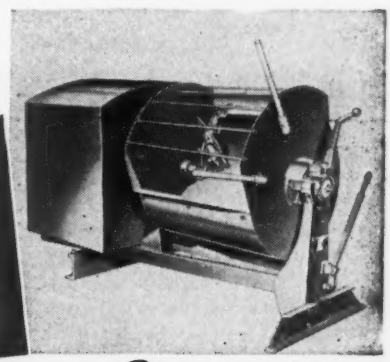
WONDER *Sand* MIXERS



New Mixing Efficiency

EXCLUSIVE TRIPLE MIXING HOES . . .

Tops in the field! Triple mixing Hoes have adjustable blades . . . easily set for correct clearance. Mixing is *thorough* and "end to end". Advance CMC design makes charging and discharging *easier than ever before!* 6 cu. ft. capacity shown. Write today for full details.

RENEWABLE DRUM LINERS

Easily replaceable, full - hard abrasion resistant alloy steel drum liners are your assurance of lowest upkeep and minimum operating costs.

CONSTRUCTION MACHINERY CO'S.
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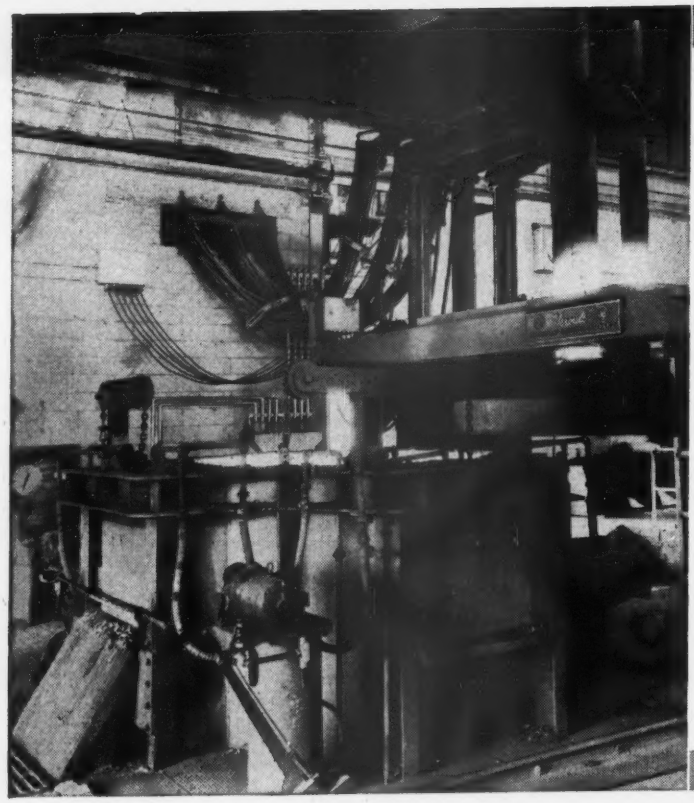

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. . . as ever, the dependable furnace for the production of high-grade stainless, alloy and rimming steels.

Precision-built, gear-driven mechanisms for maximum safety and dependability.

AMERICAN BRIDGE COMPANY
General Offices: Frick Building, Pittsburgh, Pa.

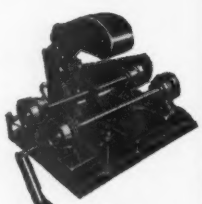
Contracting Offices in New York, Philadelphia, Chicago, San Francisco and other principal cities
United States Steel Export Company, New York

USS **AMERICAN BRIDGE**
UNITED STATES STEEL

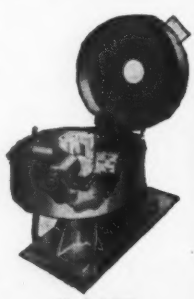
CENTRIFUGAL CASTING MACHINES

Model AS

Model J



Model M



Model J-P

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.

CENTRIFUGAL CASTING MACHINE COMPANY
Nathan Janco, *President*
P. O. Box 947 **Tulsa 1, Okla.**

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for
- CUPOLA LIGHTING
- MOLD DRYING
- LADLE HEATING
- CORE BAKING
- FURNACE HEATING

Compressed air portable oil burner equipment for lighting cupolas and drying molds. Also hand pump types.

Venturi compressed air "suction" hand torches — no preheating, for drying linings, cores, molds.

Portable venturi high pressure oil burners with adjustable burner stand for heating and drying ladles.

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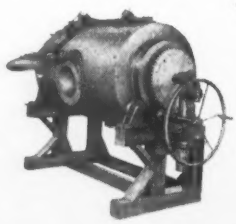

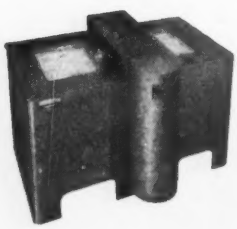

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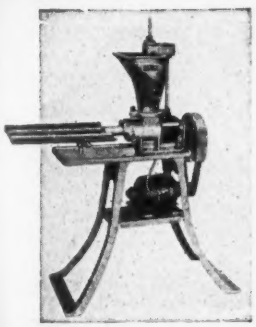

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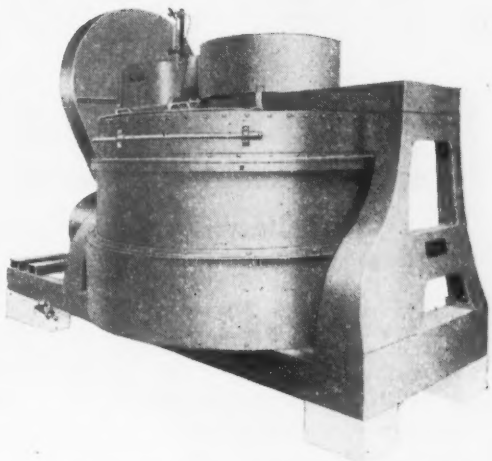

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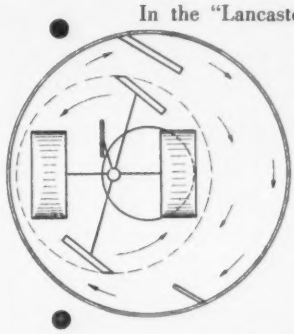

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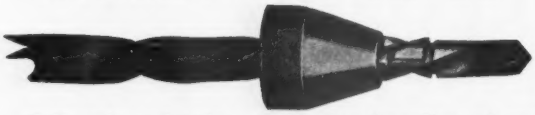

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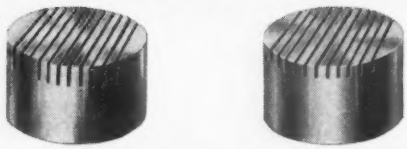

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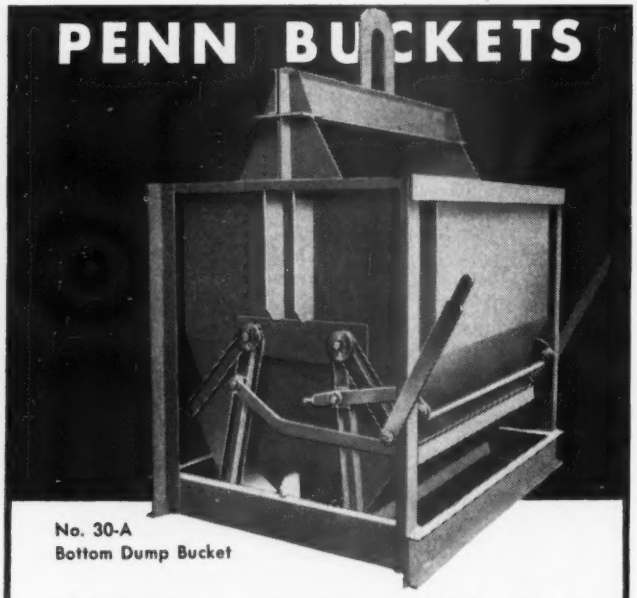

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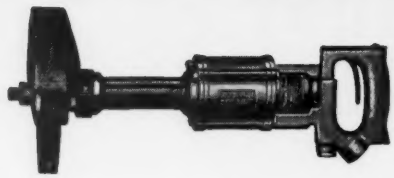

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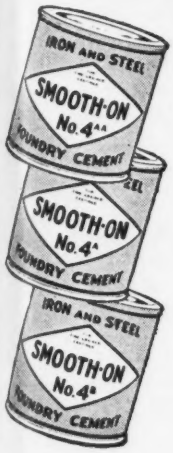

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Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

Plaster Process Castings Co., 6922 Carnegie Ave., Cleveland 3.

Scientific Cast Products Corp., 1388-92 E. 40th St., Cleveland 3, O.

PATTERN SHOP EQUIPMENT

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

Kurt Orban Co., 21 West Street, New York 6, N. Y.

Milwaukee Leather Belting Co., 1114 No. Water St., Milwaukee, Wis.

Oliver Machinery Company, Grand Rapids 2, Mich.

PATTERNS (Plastic)

Central Pattern Co., Quincy, Ill.

PATTERNS (Wood, Metal)

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.

Buffalo Pattern Works, 830 Hertel Ave., Buffalo, N. Y.

Central Pattern Co., Quincy, Ill.

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

PATTERNS (Wood, Metal) (Cont'd.)

S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.

Wellman Bronze & Aluminum Co., 2525 E. 93rd St., Cleveland 4, O.

PERMANENT MOLDS

Centrifugal Casting Machine Co., Tulsa, Okla.

Reserve Machine & Tool Co., 10026 Detroit Ave., Cleveland, Ohio.

PHOSPHOR COPPER

Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

Niagara Falls Smelting & Refining Div. Continental-United Industries Co. Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

PHOTOGRAPHIC EQUIPMENT

Eastman Kodak Co., Rochester, N. Y.

General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

PHOTOGRAPHY (Industrial)

Eastman Kodak Co., Rochester, N. Y.

PIG CASTING MACHINES

Wm. M. Bailey Co., Pittsburgh 16, Pa.

PIG IRON

Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.

Jackson Iron & Steel Co., Jackson, Ohio.

Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.

Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.

Pickands, Mather & Co., Cleveland 14, O.

Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.

Woodward Iron Co., Woodward, Ala.

PIG IRON (Silvery)

Jackson Iron & Steel Co., Jackson, O.

Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.

Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.

PINS (Flask)

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

Shanafelt Mfg. Co., 3623 Winfield Way, N.E., Canton 5, Ohio.

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

Universal Engineering Co., Frankenmuth Mich

V-G Flask & Fitting Co., Clinton, Conn.

PISTON RINGS (for Molding Machines, Compressors, etc.)

Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.

PLANT ENGINEERING SERVICE

H. K. Ferguson, 1783 E. 11th St., Cleveland 14, Ohio.

Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.

Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

PLATES (Bottom)

Adams Co., Dubuque, Iowa.

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

PLATES (Core Drying)

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.

Johns-Manville, 22 East 40th St., New York 16.

PLUMBAGO

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Frederic B. Stevens, Inc., Detroit 16, Mich.

United States Graphite Co., Saginaw, Mich.

PNEUMATIC TOOLS

Arrow Tools Inc., 1900 S. Kostner, Chicago, Ill.

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.

Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.

Dayton Pneumatic Tool Co., Dayton 1, Ohio.

Gardner-Denver Co., Quincy, Ill.

Independent Pneumatic Tool Co., Aurora, Ill.

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Joy Mfg. Co., Sullivan Division, Michigan City, Ind.

Master Pneumatic Tool Co., Inc., Orwell, Ohio.

Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

Schramm Inc., West Chester, Pa.

POLISHING MACHINES

Bradford Machine Tool Co., 659 Evans St., Cincinnati, Ohio.

POURING DEVICES

Industrial Equipment Co., Minster, Ohio.

Modern Equipment Co., Port Washington, Wis.

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

PRESSER BOARDS

Adams Co., Dubuque, Iowa.

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

V-G Flask & Fitting Co., Clinton, Conn.

PRESSURE RECORDERS

Foxboro Company, Foxboro, Mass.

PROTECTIVE MATERIALS (X-Ray)

General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

PULLEYS (Magnetic)

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.

Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

PUMPS

Construction Machinery Co., Waterloo, Iowa.

Gardner-Denver Co., Quincy, Ill.

PUMPS (Dry, Vacuum)

Allis Chalmers Mfg. Co., Milwaukee 1, Wis.

Fuller Company, Catasauqua, Pa.

Roots-Connersville Blower Corp., Connersville, Ind.

PURIFIERS

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.

PUSH-OFF MACHINES

Beardsley & Piper Co., 2424 N. Cicero, Chicago 39, Ill.

Champion Foundry & Machine Co 1553 W. Madison St., Chicago 7, Ill.

International Molding Machine Co LaGrange Park, Ill.

Milwaukee Foundry Equipment Div Spo Inc., 3238 W. Pierce St., Milwaukee 4, Wis.

PUTTY (Foundry)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O

PYROMETERS

Elematic Equipment Corp., 1150 W. Marquette, Chicago 2, Ill.

Foxboro Company, Foxboro, Mass.

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.

Illinois Testing Laboratories, Inc., 418 N. LaSalle St., Chicago 10, Ill.

Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

Pyrometer Instrument Co., Bergenfield, N. J.

Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

PYROMETERS (Immersion)

Pyrometer Instrument Co., Bergenfield, N. J.

PYROMETERS (Optical)

Pyrometer Instrument Co., Bergenfield, N. J.

RACKS (Core Ovens)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

Kirk & Blum Mfg. Co., Cincinnati 25, Ohio

RADIOGRAPHY (Industrial)

Eastman Kodak Co., Rochester, N. Y.

Eldorado Mining & Refining Ltd., P.O. Box 379, Ottawa, Ont.

Radium Chemical Co., Inc., 570 Lexington Ave., New York 22, N. Y.

RADIUM

Eldorado Mining & Refining Ltd., P.O. Box 379, Ottawa, Ont.

Radium Chemical Co., Inc., 570 Lexington Ave., New York 22, N. Y.

REFRACTORIES

Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.

Carborundum Co., Niagara Falls, N. Y.

Carborundum Co., Perth Amboy, N. J.

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

Joseph Dixon Crucible Co., Monmouth St., Jersey City, N. J.

Eastern Clay Products, Inc., Jackson, O.

Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.

Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.

Ironton Fire Brick Co., Ironton, O.

Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

Mexico Refractories Co., Mexico, Mo.

Norton Co., Worcester 6, Mass.

Richard C. Remmey Son Co., Hedley St. & Delaware River, Philadelphia 37, Pa.

REFRACTORIES (Cont'd.)

Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.

Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.

United States Graphite Co., Saginaw, Mich.

RESPIRATORS

Wilson Products Inc., Reading, Pa.

RIDDLES (Electric)

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.

Great Western Mfg. Co., Leavenworth, Kans.

RIDDLES (Hand)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.

ROD DIP

Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.

ROD STRAIGHTENERS

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

ROLLER-HEARTH FURNACES (Electric Annealing)

General Electric Co., Schenectady, N. Y.

Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.

RUBBER LINING MATERIAL

(Abrasive Resisting)

Pangborn Corp., Hagerstown, Md.

SAFETY CLOTHING

American Optical Co., Southbridge, Mass.

B. F. McDonald Co., 5112 South Hoover St., Los Angeles 37, Calif.

Pangborn Corp., Hagerstown, Md.

SAND ARRESTER TUBES

Martin Engineering Co., Kewanee, Ill.

SAND (Core, Molding, Blasting)

American Silica Sand Co., Central Life Bldg., Ottawa, Ill.

Carpenter Brothers, Inc., 606 West Wisconsin, Milwaukee 3, Wis.

Ottawa Silica Co., Ottawa, Ill.

Pangborn Corp., Hagerstown, Md.

Producers Core Sand Corp., Michigan City, Ind.

Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.

Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.

Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

SAND BLAST BARRELS

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.

Pangborn Corp., Hagerstown, Md.

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

SAND BLAST CABINETS

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.

Pangborn Corp., Hagerstown, Md.

SAND BLAST EQUIPMENT

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.

Pangborn Corp., Hagerstown, Md.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

SAND BLAST NOZZLES

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Norton Company, Worcester 6, Mass.

Pangborn Corp., Hagerstown, Md.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

SAND BLAST ROOMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Pangborn Corp., Hagerstown, Md.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

SAND BLAST TABLES

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Pangborn Corp., Hagerstown, Md.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

SAND CONTROL & TESTING EQUIPMENT

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

SAND CONVEYING and HANDLING EQUIPMENT

American Air Filter Co., Louisville 8, Ky.

C. O. Bartlett & Snow Co., 6201 Harvard Ave., Cleveland 5, O.

Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.

Clearfield Machine Co., Clearfield, Pa.

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Frank G. Hough Co., Libertyville, Ill.

Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.

Joy Mfg. Co., Joy Division, Pittsburgh, Pa.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Newaygo Engineering Co., Newaygo, Mich.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

Penn Iron Works, Reading, Pa.

Royer Foundry & Machine Co., Kingston, Pa.

SAND CONVEYING and HANDLING EQUIPMENT (Pneumatic)

Fuller Company, Catasauqua, Pa.

Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

SAND COOLING SYSTEMS

Newaygo Engineering Co., Newaygo, Mich.

SAND (Core, molding, Blasting)

Ottawa Silica Co., Ottawa, Ill.

Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.

SAND DRYERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, Ohio.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.

SANDERS (Pneumatic)

Cleco Division of Reed Roller Bit Co., Houston, Texas.

SANDING MACHINERY (Disc, Spindle, Belt, etc.)

Freeman Supply Co., 1152 E. Broadway, Toledo 5, Ohio.

Oliver Machinery Company, Grand Rapids 2, Mich.

SAND MEASURING and WEIGHING DEVICES

Baker Perkins Inc., Saginaw, Mich.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

SAND MIXERS

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Baker Perkins Inc., Saginaw, Mich.

Beardsley & Piper Co., The, 2424 N. Cicero, Chicago 39, Ill.

Clearfield Machine Co., Clearfield, Pa.

Construction Machinery Corp., Waterloo, Iowa.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, Ohio.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

Multiplex Machinery Corp., Elmore, Ohio.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Royer Foundry & Machine Co., Kingston, Pa.

SAND PREPARATION EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Baker Perkins Inc., Saginaw, Mich.

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.

Beardsley & Piper Co., The, 2424 N. Cicero, Chicago 39, Ill.

Clearfield Machine Co., Clearfield, Pa.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, Ohio.

Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.

Moulders Friend, Dallas City, Ill.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

Royer Foundry & Machine Co., Kingston, Pa.

Simplicity Engineering Co., Durand, Mich.

SAND RAMMERS

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.

Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.

SAND RAMMERS (Cont'd.)

Dayton Pneumatic Tool Co., Dayton 1, O.

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

Master Pneumatic Tool Co., Inc., Orwell, Ohio.

Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

SAND RECLAIMERS

Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.

Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

SAND SIFTING and SCREENING MACHINERY

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

American Air Filter Co., Louisville 8, Ky.

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.

Beardsley & Piper Co., The, 2424 N. Cicero, Chicago 39, Ill.

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.

Great Western Mfg. Co., Leavenworth, Kansas.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Royer Foundry & Machine Co., Kingston, Pa.

Simplicity Engineering Co., Durand, Mich.

Pangborn Corp., Hagerstown, Md.

Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

SAND STORAGE BINS & GATES

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.

Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.

Jeffrey Mfg. Co., Columbus 16, O.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

SAWS (Band, Metal, Wood)

Atlantic Saw Mfg. Co., New Haven, Conn.

Oliver Machinery Company, Grand Rapids 2, Mich.

SAWS (Cold Metal)

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

SCALES

Toledo Scale Co., Toledo, Ohio

SCALING HAMMERS

Joy Mfg. Co., Sullivan Division, Michigan City, Ind.

Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

Schramm, Inc., West Chester, Pa.

SCREENS (Shake-Out)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Barlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.

SCREENS (Shake-Out) (Cont'd.)

Beardsley & Piper Co., 2424 N. Cicero, Chicago 39, Ill.

Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Simplicity Engineering Co., Durand, Mich.

SCREENS (Vibrating)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

Simplicity Engineering Co., Durand, Mich.

SEA COAL

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Frederic B. Stevens, Inc., Detroit 16, Mich.

SEPARATORS (Abrasive)

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Pangborn Corp., Hagerstown, Md.

SEPARATORS (Air, Moisture, Oil)

American Air Filter Co., Louisville 8, Ky.

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Jas. A. Murphy & Co., Hamilton, O.

Pangborn Corp., Hagerstown, Md.

SEPARATORS (Magnetic)

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.

Homer Mfg. Co., Lima, Ohio.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

SHAKE-OUT MACHINERY

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

American Air Filter Co., Louisville 8, Ky.

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

New Haven Vibrator Co., 131 Chesnut St., New Haven 7, Conn.

Robins Conveyors, Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

Royer Foundry & Machine Co., Kingston, Pa.

Simplicity Engineering Co., Durand, Mich.

SHOT AND GRIT

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.

American Wheelabrator & Equipment Co., Mishawaka, Ind.

American Steel Abrasives Co., Galion, O.

Carpenter Brothers, Inc., 606 West Wisconsin, Milwaukee 3, Wis.

SHOT & GRIT (Cont'd.)

Clayton Sherman Abrasives Co., 3896 Lonyo Rd., Detroit 10, Mich.

Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.

Globe Steel Abrasive Co., Mansfield, O.

Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.

Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.

Pangborn Corp., Hagerstown, Md.

Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

Steel Shot & Grit Co., Inc., 39 Warren Ave., Boston, Mass.

SHOT (Peening)

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.

American Wheelabrator & Equipment Co., Mishawaka, Ind.

American Steel Abrasive Co., Galion, O.

Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.

Globe Steel Abrasive Co., Mansfield, Ohio.

Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.

Pangborn Corp., Hagerstown, Md.

Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

Steel Shot & Grit Co., Inc., 39 Warren Ave., Boston, Mass.

SHOVELS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Frederic B. Stevens, Inc., Detroit 16, Mich.

SHOVELS (Power)

Frank G. Hough Co., Libertyville, Ill.

SILICA FLOUR

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, O.

Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.

Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

SILICOMANGANESE

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

SILICON (Briquets)

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Ohio Ferro-Alloys Corp., Canton 2, Ohio.

SILICON CARBIDE (Briquets)

Carborundum Co., Perth Amboy, N. J.

Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.

SILVERY PIG IRON see Pig Iron (Silvery)

SKIMMERS

Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

SLIP FLASKS (See FLASKS, SLIP)

SLINGS (Chain)

Jeffrey Mfg. Co., Columbus 16, O.

SLIP JACKETS

Adams Co., Dubuque, Iowa.

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Fremont Flask Co., Fremont, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

SMELTERS & REFINERS

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.

R. Lavin & Sons Inc., 3426 So. Kedzie Ave., Chicago 23, Ill.

SNAGGING BELTS

Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.

SNAGGING MACHINES

Bradford Machine Tool Co., 659 Evans St., Cincinnati, Ohio.

SNAGGING WHEELS—See ABRASIVE WHEELS

SNAP FLASKS

Adams Co., Dubuque, Iowa.

Diamond Clamp & Flask Co., Richmond, Ind.

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

V-G Flask & Fitting Co., Clinton, Conn.

SODA ASH

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

Hercules Powder Co., Wilmington 99, Del.

Mathieson Chemical Corp., Mathieson Bldg., Baltimore 3, Md.

Solvay Sales Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

SOLDER

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.

SPACE HEATERS

Dravo Corp., Neville Island, Pittsburgh 25, Pa.

SPECIAL FOUNDRY ALLOYS

Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

Niagara Falls Smelting & Refining Div. Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

SPRAY GUNS

Murphy & Co., Jas. A., Hamilton, O.

New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.

SPRUE CUTTERS

Adams Co., Dubuque, Iowa.

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee, Wis.

Rice Pump & Machine Co., 1026 S. 40th St., Milwaukee 15, Wis.

STEEL SHOT

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Pangborn Corp., Hagerstown, Md.

Steel Shot Producers, Inc. Butler, Pa.

STEEL (Structural)

American Bridge Co., Pittsburgh 19, Pa.

STOPPERS (Graphite)

Joseph Dixon Crucible Co., Monmouth St., Jersey City, N. J.

STRAINER CORES

Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.

STRIPPING MACHINES

Adams Co., Dubuque, Iowa.

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.

Devenport Machine & Foundry Co., Davenport, Iowa.

International Molding Machine Co., LaGrange Park, Ill.

Milwaukee Foundry Equipment Div., Spo Inc., 3238 W. Pierce St., Milwaukee 4, Wis.

TANKS (Dewatering)

Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.

TAPE (Friction & Rubber)

Boston Woven Hose & Rubber Co., 29 Hampshire, Cambridge 39, Mass.

TELLURIUM

American Smelting & Refining Co., 120 Broadway, New York 5, N.Y.

TEMPERATURE CONTROLLERS

Foxboro Company, Foxboro, Mass.

Illinois Testing Laboratories, Inc., 418 N. LaSalle St., Chicago 10, Ill.

Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

National Forge & Ordnance Co., Irvine, Warren Co., Pa.

TESTING MACHINES (Tensile)

Harry Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

National Forge & Ordnance Co., Irvine, Warren Co., Pa.

THERMOCOUPLES

Elematic Equipment Corp., 1150 W. Marquette, Chicago 2, Ill.

Illinois Testing Laboratories, Inc., 418 N. LaSalle St., Chicago 10, Ill.

Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

Pyrometer Instrument Co., Bergenfield, N. J.

Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

TIMERS (Electric)

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

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Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

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Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

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CLASSIFIED ADVERTISING

Help Wanted

MASTER MECHANIC

Experienced in foundry maintenance work. Location: Michigan. Give full details of experience, references and salary expected with application. Address: Box 374, FOUNDRY, Cleveland 13, Ohio.

EXPERIENCED FOUNDRYMAN

Midwestern gray iron foundry desires experienced man capable of supervising production and assembly of small to medium sized cores. Must be able to teach and coordinate making of cores on benches and coreblowers. In replying please state age, experience and salary expected. Address: Box 302, FOUNDRY, Cleveland 13, Ohio.

MOLDING FOREMAN

Cleaning room foreman and trouble-shooter with grey iron foundry experience wanted for permanent position in mechanized foundry. Producing automotive castings, located in Middle West. Excellent opportunity with large, reputable manufacturing concern. Write stating experience, qualifications and expected salary. Address: Box 341, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

To supervise operation of three large jolt roll-over mold draw from pattern machines also three large jolt stripper pin lift machines, two large core blowers and one bench core blower. Must be practical molder and coremaker, understanding core assembly molds poured without flasks, able to instruct both experienced molders and coremakers and unexperienced personnel. Address: Box 291, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

Steel foundry in New England producing small and medium sized carbon and alloy castings has opening for General Foreman. Please state age, experience and salary desired in reply. Interview can be arranged. All replies kept confidential. Address: Box 311, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

Able to read blue prints; estimate costs for quotation purposes from blue prints; set up jobs in foundry; set up production molding rates; also as field man to select jobs for foundry. Must be well qualified. Address: Box 319, FOUNDRY, Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Steel foundry in New England producing small and medium sized carbon and alloy castings has opening for cleaning room foreman. Please state age, experience and salary desired in reply. Interview can be arranged. All replies kept confidential. Address: Box 312, FOUNDRY, Cleveland 13, Ohio.

METALLURGICAL ENGINEER

To take charge of all melting, sand control and laboratory in midwestern malleable foundry. Address: Box 331, FOUNDRY, Cleveland 13, Ohio.

MASTER MECHANIC

For well established mid-west foundry. State age, experience and reference in first letter. Address: Box 373, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

For a gray iron foundry in Western Pennsylvania melting 10 to 15 tons per day. Thorough experience in cupola operation, molding and core room practice, sand control and chilled castings. We operate our own pattern shop. Please give personal experience, history, availability and salary expected. Address: Box 233, FOUNDRY, Cleveland 13, Ohio.

PRODUCTION SUPERINTENDENT

Manufacturer of nonferrous cast metal items has opening for experienced manufacturing man. Knowledge of production line methods and machines essential. Salary commensurate with ability. Location Eastern Pennsylvania. Give full details in first letter including references.

BOX 337
FOUNDRY CLEVELAND 13, OHIO

Help Wanted

FOUNDRY SUPERINTENDENT

Thorough experience in gray iron foundry required. Must have technical knowledge and ability in all phases of foundry work. Company located in Indiana. State age and experience. Furnish picture. Replies held confidential. Address: Box 366, FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRY MAN

OPPORTUNITIES FOR EXPERIENCED SUPERVISORS IN ALL OPERATING DEPARTMENTS AND MECHANICAL TRADES OF LARGE STEEL FOUNDRY. GOVERNMENT OWNED DEFENSE PLANT IN CHICAGO AREA TO BE OPERATED ON ARMOR STEEL CASTINGS. COMPANY OPERATING SET-UP SUFFICIENTLY LARGE AND AGGRESSIVE TO AFFORD PERMANENT OPPORTUNITY TO MEN WHOSE PERFORMANCE PROVES TO BE OUTSTANDING.

BOX 323
FOUNDRY CLEVELAND 13, OHIO

FOUNDRY ENGINEERS

Experienced in analysis of operations and layout and design of equipment for mechanization. Write stating experience, qualifications and expected salary. Address: Box 364, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Nonferrous large modern jobbing foundry in Philadelphia area has opening for man with at least ten years' experience in supervision of production of aluminum and magnesium castings as well as all phases of modern foundry practice. Salary commensurate with ability plus production incentive. For the man with the required ability this is a permanent opportunity with tremendous potentialities. Applicants must supply complete history, experience, etc. Address: Box 372, FOUNDRY, Cleveland 13, Ohio.

MOLDING FOREMAN

Squeezer, cope and drag—for gray iron foundry. Experienced. Production minded with good working knowledge of scrap causes and elimination. Must produce results. Top salary. Ideal conditions. Company located in Indiana. Address: Box 367, FOUNDRY, Cleveland 13, Ohio.

GENERAL SUPERINTENDENT

Western Pennsylvania. Must be qualified squeezer production, experienced in gray iron and semi-steel. Automotive, farm equipment and general machinery type castings. Address: Box 363, FOUNDRY, Cleveland 13, Ohio.

CORE ROOM FOREMAN

Experienceed and with thorough knowledge of core work for gray iron foundry. Top salary paid. Experienced on production and must be capable supervisor. Company located in Indiana. Address: Box 368, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

Wanted for gray iron foundry in New York State. Experience in floor and machine molding and all phases of foundry operations. Advise age, experience and starting salary. Address: Box 342, FOUNDRY, Cleveland 13, Ohio.

PATTERNMAKER

Capable of operating shop as foreman for plaster, wood and metal patterns. First class mechanic on bench. Fine opportunity for right man. Write stating qualifications including age and salary expected. Address: Box 343, FOUNDRY, Cleveland 13, Ohio.

ALUMINUM FOUNDRY FOREMAN

Must be experienced and qualified to direct operation of aluminum foundry. A fine opportunity with good salary for the right man. Address all replies, listing qualifications to: LYCOMING-SPENCER DIVISION, AVCO MANUFACTURING CORP., 164 PARK STREET, WILLIAMSPORT, PA.

Representatives Wanted

MANUFACTURER'S REPRESENTATIVE

Leading British Company manufacturing complete range of foundry plant and machinery is desirous of appointing first class engineering company as selling agents in America and Canada. Would consider actual manufacture under license in America or Canada.

BOX 338
FOUNDRY CLEVELAND 13, OHIO

SALESMEN

High metal costs make every brass and bronze foundry a hot prospect for our metal saver pour-off ingot mold rack. Restricted territory, liberal commissions, prompt deliveries. Address: LEIGHTON M. LONG COMPANY, 220 DALE ST., TOLEDO 9, OHIO.

Positions Wanted

GENERAL SUPERINTENDENT

Over 20 years with present employer in supervisory capacity in fully mechanized automotive foundry desires change. Age 49—31 years' experience in gray iron covers all phases of production practices on all types automotive—agricultural and furnace castings. Address: Box 272, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST AVAILABLE !

At present in South America, seeks employment in the United States. Native of Mid-west with B.S. graduate work University of Wisconsin. Over ten years' experience in heat treating, engine test and inspection, blast furnace operation and foundry work. Now superintendent of small foundry in South America. Desire position in Mid-west preferably but will consider all propositions. Write full details to: Box 359, FOUNDRY, Cleveland 13, Ohio.

MELTING FOREMAN

Graduate metallurgist. 15 years' experience cupola and electric furnace melting iron to close specifications. Can handle sand control, chemical and physical testing. Address: Box 320, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEER

Twenty-four years' experience in nonferrous field. Permanent mold and sand and thoroughly familiar with all phases of foundry. Can handle job from sales contact to delivery of castings. Available at once. Address: Box 361, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Experienced all phases foundry work. Principally malleable, steel, stainless, alloy; some gray iron, nonferrous. Age 47. Young in ideas. Prefer Midwest. Address: Box 365, Foundry, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Twenty-two years' experience in the foundry. Ten years' practical experience and twelve years as supervisor. Light production to heavy jobbing work. Practical experience in every department. Cost minded and progressive. Now employed. Address: Box 355, FOUNDRY, Cleveland 13, Ohio.

PLANT ENGINEER

Twenty-five years' experience of foundry mechanization in the engineering design, development, plant layout, equipment installation, maintenance and operation for reduced costs and increased production. Age 52 years, best references. Address: Box 351, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Positions Wanted

FOUNDRYMAN—CHIEF METALLURGIST

University graduate. Chief metallurgist past five years in malleable and gray iron shop. Age 35. Eleven years' experience in automotive, malleable, steel and gray iron foundries. Experienced in metallurgy, cost control, scrap reduction, gating, core and molding sand, cupolas and electric furnaces. Desire connection with organization interested in achieving high quality, low cost efficient operation. Address: Box 362, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT OR GENERAL FOREMAN

Large or small castings in gray iron or nonferrous, green or dry sand. 25 years' practical experience in all foundry details. New Jersey preferred. Age 56. Address: Box 352, FOUNDRY, Cleveland 13, Ohio.

PLANT MANAGER OR FOUNDRY SUPERINTENDENT

Gray iron, twenty-eight years' experience, production or jobbing, mechanized or otherwise. Seventeen years in executive capacity and a background of specialized training in factory management. Age 46, excellent references and recommendations. Address: Box 357, FOUNDRY, Cleveland 13, Ohio.

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Over 22 years of practical foundry experience in steel, iron and high-alloys. Well versed in modern practice. Have served from foreman to superintendent with excellent record. Employed—available on reasonable notice. Address: Box 356 FOUNDRY, Cleveland 13, Ohio.

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Twenty years' experience in aluminum and magnesium permanent mold with some die cast experience. Will go anyplace. Address: Box 350, FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY MANAGER OR SUPERINTENDENT

Twenty-four years' experience—over 18 years in supervision, sales and management. Complete practical experience and technical knowledge. Production and jobbing. Address: Box 324, FOUNDRY, Cleveland 13, Ohio.

WEIGHT ESTIMATING

Estimating of casting weights furnished by return mail. Accurate, reliable and confidential service. Nominal fee. Send blueprints: Address: CHARLES E. ROLAND, 215 FOREST DRIVE, ITASCA, ILL.

FOUNDRY MANAGER OR SUPERINTENDENT

Practical, progressive, experience of 27 years in small, medium and large castings in cast iron and nonferrous metals. Take charge of all phases of work in office and foundry. Employed. Address: Box 316, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Graduate industrial engineer—16 years' manufacturing experience—10 years in gray iron foundry including superintendent, industrial engineer and management. Now employed—39—married. Address: Box 334, FOUNDRY, Cleveland 13, Ohio.

SALES EXECUTIVE

Thoroughly experienced, age 37 and well known in Ohio for magnesium, aluminum, bronze patterns. Now connected with reliable foundry desires permanent change. Present connection knows of this advertisement. Address: Box 349, FOUNDRY, Cleveland 13, Ohio.

COMPTROLLER

Treasurer with industrial engineering and cost control background. Ten years' steel foundry experience. Wisconsin graduate in accounting. Address: Box 347, FOUNDRY, Cleveland 13, Ohio.

FOREMAN

Foundry foreman or general foreman with experience in steel, malleable and gray iron; jobbing and large production operations. Many years' experience on electric furnaces melting steel and iron and duplexing heavy tonnage. Will consider any location but prefer Mid-west. Available immediately. Address: Box 345, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

INDUSTRIAL ENGINEER

Industrial engineer graduate. 11 years' experience as a foundry engineer and production worker in modern foundries. Will consider any location. Address: Box 346, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thoroughly capable and of proven ability to reduce costs, reduce scrap percentage and to better quality of castings. Good success in handling labor relations. Grey iron and semi-steel. Now employed. Address: Box 218, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR ASSISTANT SUPERINTENDENT

Practical, with a technical education. 45 years old. Sixteen years as foreman and superintendent. Experienced in production of jobbing and machine tool castings. Well versed in cupola practice, cast iron analysis. Prefer East or South East. Address: Box 339, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN

Desires position—gray iron or nonferrous, light jobbing, production, soil pipe, farm implements. Prefer western or central New York but not essential. Address: Box 354, FOUNDRY, Cleveland 13, Ohio.

SPECTROGRAPHER

Ph.D. degree with eight years' experience in nonferrous metal, two years with quantometer. Has recently developed greatly improved method of spectrographic analysis. Address Box 360, FOUNDRY, Cleveland 13, Ohio.

FOREMAN OR SUPERINTENDENT

Practical gray iron foundry man (making change) about May 1st, desires position as foreman and superintendent in production or jobbing. 35 years in foundry game from molder to superintendent. Practical on cupola mix by analysis all types of green or dry sand molding. Squeezer rollover and bumper. Good rigger for production. Good references. Address: Box 371, FOUNDRY, Cleveland 13, Ohio.

Opportunities

OPPORTUNITY

Mechanical engineer with machine shop and foundry experience has $20,000 to invest with services in small going shop. Address: Box 220, FOUNDRY, Cleveland 13, Ohio.

Available Capacity

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO. RD 3, Lititz, Pa.

OPEN FOUNDRY TIME

Large capacity available for small to medium size ferrous and nonferrous castings. Production heat treating facilities.

DONEGAL MANUFACTURING CORP.
635 E. MARKET MARIETTA, PENNSYLVANIA

AVAILABLE CAPACITY

For gray iron castings. We specialize in close tolerance production work from a fraction of an ounce to fifty pounds. Also short orders. Are interested in securing D. O. jobs at present. Address: CADILLAC FOUNDRY CO., INC., P. O. BOX 218, CADILLAC, MICHIGAN.

WORK WANTED

On grey iron castings. Open capacity available on squeezer work. Contact: PEWAUKEE FOUNDRY CO., INC., 604 HICKORY STREET, PEWAUKEE, WISCONSIN, Phone—7021.

OPEN CAPACITY

Have open capacity for squeezer, cope and drag and floor work in gray iron. ADDRESS: PHARISBURG FOUNDRY CO., MARYSVILLE, O. R.1.

Employment Service

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$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high-grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

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$3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. Address: **R. W. BIXBY, INC., 101 DUN BUILDING, BUFFALO 2, NEW YORK.**

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In all categories—EXECUTIVE, TECHNICAL, ADMINISTRATIVE, SUPERVISORY, covering the entire fields of FOUNDRY (Ferrous and Nonferrous), PERMANENT MOLD, DIE CASTING.

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All Departments. All Locations.	
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Foundries For Sale

SMALL FOUNDRY FOR SALE

On New York Central Railroad side track in Lockport, New York. Floor space of molders approximately 11,000 square feet with exceptional dumping ground for disposal of slag and waste indefinitely at lowest expense over declivity on the land. Considerable foundry equipment thrown in for the price of assessed value of the real estate. Address: JEFFERSON UNION COMPANY, LOCKPORT, NEW YORK.

GRAY-IRON FOUNDRY

Brick and steel foundry with two clear spaces 80 x 320 ft. with overhead monorail, story height 13 ft. 6 in., gable 23 ft., attached building 40 x 50 ft., story heights 15 ft. 6 in. and 13 ft. 4 in., has two No. 7 Whiting cupolas 72 in. in diameter. Contains equipment, ideal for mechanized operation, plenty dumping ground, built 1917, composition roof, vicinity population about 9000, near center of U. S. population, expect natural gas this year, served by two major railroads, water transportation available, city hydrant fire protection, land for expansion. Subject to withdrawal without notice. Address: Box 358, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

Small, gray iron foundry and machine shop. Only commercial foundry in the state. Takes $10,000 to handle—balance on easy terms. Owner past 70 and wishes to retire. Address: Fred S. Bark, Watertown, South Dakota.

Foundries For Sale

FOR SALE

STEEL AND BRICK CONSTRUCTED BUILDING
24,000 Square Feet
Approximately Eight Acres of Land
Railroad Siding

Suitable For
GRAY IRON AND NON-FERROUS FOUNDRY

Available Immediately

LOCATED AT MINERAL RIDGE, OHIO

RIDGE CASTING DIVISION
HELLIER COAL & COKE COMPANY
1003 Union National Bank Bldg.
Youngstown, Ohio

Phone: Youngstown 4-5394

FOUNDRIES FOR SALE

GRAY IRON FOUNDRY. All modern equipment for quantity production of light castings. Capacity 150 tons daily. Experienced organization. Operating at capacity.

GRAY IRON FOUNDRY. Well established business producing machinery castings up to 10 tons. Good buildings and equipment. Owner wishes to retire.

GRAY IRON FOUNDRY. Small foundry with experienced organization. Produces light castings. Priced to sell.

BRASS-ALUMINUM FOUNDRY. Capacity 15 moulders. Steady customers. Owner wishes to retire.

EDWARD H. ZOLL
INDUSTRIAL PROPERTIES THROUGHOUT THE EAST
790 Broad St. Newark 2, N. J.

FOR SALE OR LEASE

Well equipped brass and aluminum foundry. Plenty of work at present. Old age and bad health reason for selling. Address: C. J. Doerr, 725 N. Delphos St., Kokomo, Indiana.

RECEIVER'S SALE
OF
INLAND GREY IRON FOUNDRY
317 WILLIAMS STREET
WATERTOWN, WISCONSIN
BY ORDER OF CIRCUIT COURT,
MILWAUKEE COUNTY, MILWAUKEE, WIS.

I will accept private bids at my office up to and including March 8, 1951. A 10 percent deposit must accompany offer.
Highest bid will be submitted to Circuit Court on Friday, March 9, 1951, at 9:30 o'clock a.m., Court House, Milwaukee, Wisconsin.
Foundry has 15 ton capacity; railway siding, 280 feet; 40 foot yard; good labor market; and only 40 miles from Milwaukee, Wisconsin.
Building is situated on 3 acres of land, is 80 feet by 120 feet and has 18 feet concrete ceiling. Replacement cost—$70,000.00.
Equipment as follows: Cupola 60 inches, lined to 42 inches, 5 tons per hour. Sturtevant blower. Mechanical charger, 1,000 pound capacity. Mono rail, length of plant. Replacement cost—$25,000.00.
Further details and inventory on request. For inspection, call:

MR. A. KUENZIE, PRES.
OTTO BEEFELD CO.
WATERTOWN, WIS.

FOUNDRY FOR SALE

Pouring four tons gray iron a day. Grossing $150,000 a year. North Central Pennsylvania. $50,000 for plant complete.

BILLARD MACHINE & TOOL CO.
MANSFIELD, PA.

FOUNDRY FOR SALE

Most profitable medium size jobbing foundry in this section of the country. Well equipped, situated between Cleveland and Detroit. Arranged for production. Deal involves $250,000.00. Owners must retire. Opportunity for user of castings with certificate of necessity. Address: Box 340, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRY

In South Eastern Wisconsin. Established over 30 years. Capacity 25 tons daily. Fully equipped for castings to 100 lbs. Complete organization. Very profitable. $100,000 to handle. Address: Box 348, FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

Fifty 13 x 18 single pin steel flasks with 4" cope 3" drag. Address: Box 304, FOUNDRY, Cleveland 13, Ohio.

WANTED

Tumbling mill, minimum clear diameter 36-inches. Minimum length 60-inches clear. Address: INDUSTRIAL IRON WORKS, POST OFFICE BOX 4625, PORTLAND 2, OREGON.

WANTED

Tabor-squeeze stripping molding machine. Kindly state age, condition and price. Hines aluminum pop-off flasks in the following sizes:

12 x 20
12 x 23
14 x 16

NATIONAL FOUNDRY CO.
OF NEW YORK, INC.
10 SANDFORD STREET
BROOKLYN 5, NEW YORK

WANTED

48 x 42 or 36 x 42 Wheelabrator dry dust collector. Approximately 5000 CFM loader for 27 x 36 American Wheelabrator.

PIONEER FOUNDRY & MFG. CO.
GILBERTVILLE, MASS.

WANTED TO BUY

1—24" sand conveyor belt complete with rollers for 100 ft. installation.
1—24" sand conveyor belt complete with rollers for 40 ft. installation.

BOX 305
FOUNDRY CLEVELAND 13, OHIO

WANTED

CUPOLA ALSO MULBARO BARROWS

#4 or #5 size cupola.

STARK FOUNDRY CO.
PHONE 4-5107 OR WRITE
STATION "A", CANTON, OHIO

WANTED

1 (one) used No. 250 Stroman tilting furnace. Address: ENTERPRISE BRASS WORKS, MUSKEGON, MICH.

PATTERN EQUIPMENT

Cash for large or small lots of complete, new or used patterns and core boxes for the making of ferrous or nonferrous castings used in building, plumbing trades, hardware items, art goods or just about anything. Must be reasonable. Write prices, information to: Box 344, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

WANTED

Sand blast parts or equipment.
Address: DIAMOND SALES, INC.
5654 WEST JEFF., DETROIT 9, MICH.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

WANTED

Small or medium gray iron foundry located in upper Midwest. Present management may stay if desired. Light and medium weight castings. Write complete information. Address: Box 287, The FOUNDRY, Cleveland 13, Ohio.

WANTED

One precision aluminum match plate flask approximately 24 x 36 with 5" cope 5" drag. Also one one-ton air hoist with 15 to 20 foot lift. State condition and price in first reply. Address: STEEL HEDDLE MFG. CO., GREENVILLE, S. C.

WANTED

Electric furnace 350 to 5000 lbs. For cast iron and steel. Give voltage, equipment, condition and price. ADDRESS: EMPIRE PATTERN & FOUNDRY CO., BOX 1647, TULSA, OKLAHOMA.

NONFERROUS FOUNDRY

Do you want to sell yours? Do you think of enlarging? Do you need capital and active partner with experience? Northern Ohio location preferred. Address: Box 369, FOUNDRY, Cleveland 13, Ohio.

WANTED

Pipe fitting patterns conforming to American Standard 125 pound flanged. Also, Bell and Spigot fitting patterns conforming to AWWA Standards. Address: Box 315, FOUNDRY, Cleveland 13, Ohio.

WANTED

Osborn 405 or 405-77 and 332 roll-out type molding machines. Address: FRANK FOUNDRIES CORP., MUNCIE, INDIANA.

WANTED

One #2 Simpson muller screening unit and magnetic separator. State condition and price in first reply. Address: Box 978, FOUNDRY, Cleveland 13, Ohio.

WANTED

No. 2 Simpson, No. 610 Clearfield muller or No. 50 or larger speedmuller with skip hoist.

H. W. CLARK CO.
MATTOON, ILLINOIS

For Sale

SOIL PIPE AND FITTING EQUIPMENT

Assorted patterns, arbors, pipe machine, special ladles and other equipment necessary for the manufacture of soil pipe and fittings. Address: J. F. QUEST FOUNDRY CO., 900 SOUTH 4th ST., MINNEAPOLIS 15, MINN.

FOR SALE

One International core rollover draw molding machine size 30 x 16, type AN, serial #46505, draw 12" to 30", table 28" x 42" pneumatic holddown. 5 core making stations, complete conveyors. Address: FENTON FOUNDRY SUPPLY COMPANY, DAYTON, OHIO.

FOR SALE

Baker Perkins core sand mixer, No. 16½ 30 H.P. motor—220/440 volts Ser. 42079 Elec. controls inc. Cap. 25 cu. ft. Address: EDWARD ANDREWS TOOLS MACHINERY CO., 5842 TIREMAN AVE., DETROIT, MICHIGAN.

For Sale

FOR SALE

Pangborn "CH" DUST COLLECTOR
Serial #3889—5500 C.F.M.—9" Static Pressure —Cloth Covered Screens. 25 H.P.—220/440—3 Ph.-60 totally enclosed Allis-Chalmers Motor. Direct connected to exhaust fan. 23¾" Inlet—26¾" Outlet.
Motor driven Vibrating Screen Cleaner.
Four Compartment with individual Hoppers one of which is fitted with elevator for sand cleaning. Overall dimensions: 8' x 8' x 30' if supports & hoppers removed.
Supporting angle iron structure will clear truck. Can be moved on highways or freight cars without dismantling.
Excellent condition. Price $2000.00 fob Cin'ti, O.

ALSO

MAGNETIC SEPARATOR Mfgr: Dings Magnetic Separator Can be used with DUST COLLECTOR. Size: 12" x 18"—110 V.—s.ph. Motor 2 hp. Ser. R5771. $600.00 fob Cin., O.

PANGBORN BLAST PEENING CABINET 4 spindle automatic table equipped with BVR-7 Pangborn abrasive separator & bucket-belt elevator, 20 hp, 5 hp and 2 hp Motors included. $2000.00 fob.

Pangborn—SAND BLASTER Model 1AV11—$150.00 fob.

Demler No. 2 CORE MACHINE—air operated, $225.00 fob.

Worthington AIR COMPRESSOR
17 x 13, single stage, double acting, non lubricating type (processed air), water cooled. Displacement 912 cfm, BHP required 120, suction pres. 5#, Ga., Discharge pres. 55# Ga. Unit consists of Compressor only, no motor. $2250.00 fob.

2 ton Yale Heavy Duty Cable King Electric Hoist $500.00 fob.

Sand Cutters—Am. Foundry Mfg. No. 89/70 Model M.
(2) Automatic Elec. LO-LIFT trucks 6000# cap. complete with Batteries and Chargers.
(1) Simplicity Separator 2 x 3
(1) Screenarator, Portable
(1) Yale Elec., 10' Lift Platform Truck
(1) Schramm Air Compressor 75 hp.
Cranes—overhead & jib, all sizes
Hoists—electric, hand, air—1 to 10 ton
Air Compressors—from 1 hp up
Foundry Equipment. Send us your inquiries.

ALLIED MATERIALS HANDLING COMPANY
4657 SPRING GROVE, CINCINNATI 32, O.

FOR SALE

AMERICAN SANDCUTTER
Model M Size 99/80. Equipped with five 220 volt 60 cycle 3 phase motors; in excellent condition. ONLY $4,650.00 NET CASH
FOB our plant. This is offered for sale because our foundry department has been discontinued. We invite your inspection.

GILBERT & BARKER MFG. COMPANY
WEST SPRINGFIELD, MASSACHUSETTS

STACKING MACHINES FOR SALE

Practically new, used about 2 months, 4 International stacking machines. Type JSK-7, jolt, squeeze, pin strip molding machines. Also, approximately 1200—13 x 26 aluminum stack flasks and 160—15 x 29 aluminum bottom boards. Address: BROOKS FURNACE CO., ALBION, MICH.

FOR SALE

1—Herman Rollover Molding Machine 50" x 78" Table—A-1 Condition.
1—Herman Rollover Molding Machine 36" x 60" Table—A-1 Condition.
2—#405 Osborn Rollover Molding Machines—A-1 Condition.
2—#2047-1 Osborn Hydraulic Draw Core or Molding Machine, Power rollover and air operated clamps. Used for Cylinder Head Production—Like new.
2—#147-1 Osborn Core Machine, Hand ram, Power rollover and draw—New.
4—#1000 Fisher Automatic Electric Tilting, Nose Pouring Furnaces—A-1 Condition.
3—#94 Osborn Core Blowing Machines—Like new.
1—Pangborn 28 cuft. Type CK ser. #711381, with Power Loader Type FN ser. #614382.—A-1 Condition.
Steel Flasks Equipment as follows:

Sets	Size	Drag	Cope
100	19" x 26"	3" x 6"	4"
182	19" x 16"	3½"	4½"
19	18" Round	3½" or 8"	3½" or 8"
30	17" x 27½"	4"	4"
16	20" x 35"	4"	4"
40	22" x 28"	4"	4"
13	48" x 63"	6"	4"
47	14" x 30"	3"	4"–Sterling–New

All copes are barred

EUCLID FOUNDRY & MACHINERY EQUIPMENT CO.
15019 SARANAC ROAD CLEVELAND 10, OHIO

For Sale

FOR SALE

No. 405 Osborn jolt rollover and pattern draw molding machine. 64" by 67", 3000 lb. jolt capacity. $2000.00.

BALCHER MACHINERY SALES
1884 S. COMPTON RD.
CLEVELAND HEIGHTS 18, OHIO

FOR SALE

1—10 ton cupola
1—15 ton cupola
1—G.E. centrifugal compressor or blower
Perfect Condition

THE FINCH MFG. CO.
SCRANTON PENNSYLVANIA

FOR SALE

WHITING POUR-RITE LADLE HANDLERS

1—Model 1000, 2'6" lift
1—Model 2000, 2'7" lift
BOTH NEW

T. B. WOOD'S SONS CO.
CHAMBERSBURG, PA.

FOR SALE

1—Whiting powdered coal fired holding furnace complete with #3 Whiting Pulverizer with 7½ HP motor.

NYLEN PRODUCTS CO.
ST. JOSEPH, MICH.

FOR SALE
MOLDING MACHINE

1—International R E S—jolt, squeeze, rollover draw—14" cylinder—6" draw.
1—International P K L—jolt squeeze air pin lift —14" cylinder—5½ lift.

BOX 353
FOUNDRY CLEVELAND 13, OHIO

EQUIPMENT FOR SALE

Twin burner oil fired Sklenar melting furnace, 600# capacity—$850.00.
2' 350# Detroit electric furnace, with bases and shells.
1—12000 volt primary 153 KVA, Kuhlman transformer.
1—low voltage switch for alternating between the two furnaces. All bus bars, meters, etc., for above $1200.00, complete, or will sell equipment piecemeal.

BUCK IRON COMPANY
ROUTE #1 QUARRYVILLE, PA.

FOR SALE

1—Gardner-Denver 8 x 9 Air Compressor with 25 HP. Motor.
1—3000 lb. Worm Gear Ladle V-Type Bale.
1—JDF. International Jolt Strip Machine.
6—"G" Rollover Machines 20 x 8.
1—SPO Jolt Strip Squeeze Molding Machine.
2—Osborn J-75 Jolt Squeezers 10".
4—Tabor Jolt Squeezers 10".
1—Electric Riddle.
1—Model "S" Beardsley & Piper Screenarator.
2—Jeffrey Sand Conditioners.
1—Royer Sand Conditioner.
1—Sprue Cutter with 2 HP. Motor.
1—#3E Demmler Core Blower.
1—North American Blower with 15 HP. Motor, 2100 C.F.M., 16 oz. pressure.
1—North American Blower with 5 HP. Motor, 320 C.F.M., 32 oz. pressure.
6—10" New—Haynes Jolt Squeezers.
6—12" New—Haynes Jolt Squeezers.
1—Osborn Jolt Rollover Machine, Model 243.
1—Chicago Pneumatic Air Hoist.
1—Osborn Molding Machine Model 342.
1—International Molding Machine HJ 16 x 6.
3—Charging Buckets for #9 Cupola.
1—Redford Core Blower.
1—Modern Equipment Co., Worm Gear Receiving Ladle, 3000 lb. capacity.
1—Arcade Jolt Strip Squeezer.
6—International Power Jolt Hand Rollover Table size 20 x 30.
1—International Rollover Type R.
1—Ladle Cart with 5 Ladle Pots, 350 lbs. capacity.
1—Chisholm & Moore Electric Hoist, 2 Ton capacity.
1—Band Saw.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST. KALAMAZOO 52, MICH.

For Sale

FOR SALE

MOLDING MACHINES
1—International Type GR Stationary 24 x 10
1—International Type RJ Stationary 14 x 8
1—International Type G Stationary 24 x 10
1—International Type R Portable 24 x 10
1—International Type F Stationary 26 x 8
1—International Type M Portable 24 x 10
1—Osborn 74W Plain Squeeze Portable
2—Osborn 75W Plain Squeeze Portable
4—Arcade 72-28 Jolt Squeeze Stationary
2—SPO #305 Jolt Strippers
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers
1—SPO #4½ JHS Jolt Hand Strip
BLOWERS FOR CUPOLAS AND FURNACES
2—15 HP Spencer Turbine 2250 CFM @ 16-oz.
1—Redford Bench Type Cartridge Core Blower
1—Connersville rotary 24 cu. ft. per rev. 6200 C.F.M.
Maxon-Premix Blowers for Gas ¼ to 1 HP
METAL MELTING EQUIPMENT
1—V-ball worm gear Crane Ladle 38" dia. 38" deep, 6000# cap.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired
New 32" to 41" dia. shell cupolas made to order.
TUMBLING MILLS AND SAND BLAST
1—Pangborn No. 2 GH direct pressure type sand blast barrel, motor driven. Complete unit.
1—Pangborn Sand Blast Unit, including generator tank, shot cleaner, bucket elevator. Suitable for use with room
MISCELLANEOUS
1—American Sand Cutter 72"
2—#16 Roto-clone units complete
1—Continuous Heat Treat Furnace 57' long. 1200° F. max.
2—Sly Economy #12 Cloth Screen Dust Collectors
1—Demmler #1 Core Blower
1—9 x 8 Ingersoll Rand Air Compressor, with motor
4—Heavy Duty Flexible Shaft Grinders 2 HP
Complete stock of rebuilt mill and dust exhaust blowers

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

Sand cutter 79/60, American model M, serial No. M 298. All electric—220 V. A-1 condition. Address: EMPIRE PATTERN AND FOUNDRY CO., BOX 1647, TULSA, OKLAHOMA.

FOR SALE

TURBO BLOWERS (3 Phase, 60 Cycle)

cfm	Pressure	Make	Motor H.P.	Volts	Speed
3500	40 oz.	Spencer	60	440	1800
1000	32 oz.	Spencer	15	220	
900	24 oz.	Spencer	10	220/440	
225	10 oz.	Spencer	1	220/440	3600

PRESSURE BLOWERS (3 Phase, 60 Cycle)

2500	7 oz.	Sturtevant	15	220/440	1800
2400	14 oz.	Mahr	15	220/440	3480
1800	1 in.	Sturtevant	2	220/440	
1000	12 oz.	Nth.Amer.	5	220	3600
950	16 oz.	Nth.Amer.			
800	8 oz.	Sturtevant	7½	220/440	3600
800	8 oz.	Nth.Amer.	3	220	3600
800	24 oz.	American	10	220	3600
667	8 lb.	AllenBillmyre	50	220	3560
450	6 lb.	A&B	30	220/440	3450
340	20 oz.	AllenBillmyre	3	440	3600
275	16 oz.	Nth.Amer.	2	220	3600
150	12 oz.	Nth.Amer.	1	220	3600

MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND, OHIO

EQUIPMENT FOR SALE

1—Osborn #405-77 Jolt Rollover Pattern Draw
2—Osborn #403 Jolt Rollover Pattern Draw
2—Osborn #332-38 Jolt Squeeze Rollover Draw
4—Osborn #275-JW Jolt Squeezers
2—Osborn #42 Jolt Hand Rockover Core Machines
2—Osborn #601 Jolt Rollover Pattern Draw
1—Osborn #602 Jolt Rollover Pattern Draw
1—Davenport 48SA Jolt Rollover Pattern Draw
1—Herman 1500 lb. Jolt Rollover Pattern Draw
2—International 27 x 16 Jolt Rollover Pattern Draw
2—Milwaukee #125 Pin Lift Jolt Squeezers
1—Sly Centri-blast Wheel Type 8 Ft. Table. Excellent Condition.
2—International Jolt Squeezers
3—Davenport Jolt Strippers
2—Tabor Jolt Rollover Pattern Draw 30 x 40 Table.
2—S.P.O. Jolt Squeeze Pin Lift Machines
12—Hand Rockover Core Machines — Various Sizes
3—Demmler #2 Core Blowers
1—Herman 3000 lb. Jolt Rollover Pattern Draw

BOX 370
FOUNDRY CLEVELAND 13, OHIO

CLASSIFIED ADVERTISING

FOR SALE

Beardsley & Piper #30 sandmuller with cooling hood and skip loader. Excellent condition. Used less than 3 months.
Simplicity Mod. B.G. double deck 3' x 8' shakeout. Excellent condition.

THE SCHAIBLE COMPANY
1086 SUMMER STREET
CINCINNATI 4, OHIO
TELEPHONE: GRANDVIEW 5000

EQUIPMENT FOR SALE

1—Milwaukee #165 Jolt Squeeze Pin Lift.
1—Late Model Slightly Used Model AA American Sandcutter.
1—American Wheelabrator Tumblast 27 x 36. Excellent Condition.
1—Pangborn Late Model Slightly Used Rotoblast Six Foot Table Like New.

NARRAGANSETT GREY IRON FOUNDRY
130 WEST RIVER ST.
PROVIDENCE, R. I.

FOR SALE

Chicago pneumatic and Ingersoll-Rand drills, scalers, chippers, riveters, etc., like new, far below list prices. Write for stock and price list. Address: HAYNES EQUIPMENT CO., INC., 144 FULTON ST., NEW MILFORD, N. J., PHONE: ORADELL 8-2683.

FOR SALE

One Herman rollover moulding machine, late model, in excellent condition, size 40 x 58" 3740 pounds rollover capacity. Equipped with air clamps. Address: Box 328, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Williams clamshell bucket—¼ cu. yard. Closed head type hook on single line, size 879C. Like new. Price: $850.00. Address: R. A. Parkinson & Son, 519 N. Delaware Ave., Philadelphia 23, Pa.

For Sale

FOR SALE

1—Mulbaro
16—275 JW Stationary or Portable molding machines
1—3 WA Multi TAblast Wheelabrator 10' Table
4—4' auxiliary Tables
6—Walker York Coke fired melting Furnaces
12—1 ton worm geared ladles
2—1000# C.I. Pot Bellevue Tilting furnace
2—Swing Frame grinders
2—Detroit Electric Furnace 350#
1—Detroit Electric Furnace 500#
3—20 H.P. North American Blowers
4—Osborn 2047 Jolt Rollover molding machines

we are always in the market for good used Foundry Machinery

UNIVERSAL MACHINERY & EQUIPMENT CO.
320 E. BROAD ST.
SHILLINGTON, READING, PA.
R. B. HARRISON, MANAGER FOUNDRY DEPT.
PHONES READING 30311—40146

FOR SALE

One (1) drawer type core baking oven-gas fired —10' 6" wide x 6' 0" deep x 7' 6" high inside— 8 drawers with a total shelf area of 150 sq. ft. All controls and safety equipment included. Address: Box 313, FOUNDRY, Cleveland 13, Ohio.

MOLDING MACHINES

4—International 20" x 8", Type G
1—Osborne Jolt R.O. #243
1—Osborne Jolt R.O. #242
1—40-ton Case 220 D.C. Crane, with 10-ton Aux., 87'-6" span.
1—15-ton Whiting 44'-7" Span Crane, 3/60/220

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO., NOT INC.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

FOR SALE

2 #4 Whiting cupolas
D sections only—like new.
Our cost ..... $2076.00 ea.
Selling price ..... $2076.00 ea.

F.O.B. Wichita, Kansas

SERVICE FOUNDRY INC.
330-340 N. ROCK ISLAND AVE.
WICHITA, KANSAS

For Sale

FOR SALE
SAND BLAST EQUIPMENT

Pangborn 28 GK 2 Rotoblast barrel, complete with loader. Over $5500.00 spare parts, A-1 condition $5000.00
Pangborn Rotoblast cabinet, type ES-213. Used for cleaning propeller blades. Price new $20,000.00. Now only $4250.00 as is.
Pangborn 2 GF-Tum-bbl. Good condition.
Pangborn direct pressure tank, model AQI, like new $575.00.
Baird tumbling barrel, approximately 2 cubic feet. Complete $250.00.
Rubber Sheets, size ⅜" x 48 x 48 ..... .75c lb.
Sand Blast Cabinets, generators, dust collectors and blowers. All kinds and sizes. Like new, 60% less list price.
Crane—2-ton, twin hook—21' span.....$400.00.
Washing machine and rinse, 19'L x 5'W. Conveyor type $350.00.

DIAMOND SAND BLAST INC.
5654 W. JEFF. AVE.
DETROIT 9, MICHIGAN

FOR SALE

2 Osborn core blowing machines No. 91-15, almost new, complete with sand reservoir 8½" x 12" opening, blow plate to suit, horizontal clamps, table wearing plate and manually controlled hand and foot operating valves. Immediate delivery.

ARCADE MALLEABLE IRON COMPANY
WORCESTER, MASS. TEL: 3-5414

FOR SALE

2—Osborn Jolt, Squeeze, Rollover, Draw Molding Machine
1—Besly 53" Dia. Surface Disc Grinder
1—Kent-Owens #2 RV Milling Machine
Complete Steel Converter Production Equipment Including Shells, Tilting Assemblies, Blower and Motor, and Controls

GUNITE FOUNDRIES CORPORATION
ROCKFORD, ILLINOIS

FOR SALE

No. 2060, Spencer-Turbo-Blower. 60 H.P. 220/440, 3, 60, 4500 CFM @ 32 Oz. Excellent condition. New 1946, replacing with larger blower. Available now, price $4,000 complete with 440 volt starter. Address: DONOVAN, INC., 1080 HAZEL AVENUE N., ST. PAUL 6, MINN.

CLASSIFIED ADVERTISING RATES

POSITION WANTED—Minimum advertisement set solid, 30 words or less, $2.50. Additional words 9c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $5.00. Additional words 15c each.

NOTE—If replies are to be sent to a box number in care of THE FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Twelve Times
1 inch	$ 15.00	$ 13.75	$ 12.50	$ 11.25
2 inches	27.00	25.00	23.00	21.00
3 inches	40.00	36.50	33.50	30.00
4 inches	50.00	46.00	41.50	37.50
5 inches	60.00	55.00	50.00	45.00
6 inches	73.50	66.50	60.00	53.50
7 inches	82.50	75.00	67.50	60.00
8 inches	91.50	83.50	75.00	66.50
1 column	110.00	100.00	90.00	80.00
Half Page	162.50	150.00	137.50	125.00
Full Page	275.00	250.00	225.00	200.00

Remittance should accompany advertisement when submitted—Cash Discount 2%, 10 days.

Classified Forms Close the 13th of Month Preceding Issue

FOUNDRY

Penton Building, Cleveland 13, Ohio

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"... $26,500,000 worth of U.S. Savings Bonds a year under company Payroll Savings Plan..."

CHARLES E. WILSON

"General Electric employees are buying more than $26,500,000 worth of U. S. Savings Bonds a year under company payroll savings plans. Since the inception of our savings plans in 1917, General Electric employees have saved $445,000,000 of which $280,000,000 consisted of the purchase of United States Savings Bonds since May, 1941. The record speaks for itself."

The record of General Electric Company, and the records of more than 21,000 other large companies, prove that employees *want* to save the easy, automatic way—the Payroll Savings Plan.

As of November 1, 1950, more than 8,000,000 employees were buying U. S. Savings Bonds *every month*. While the figure was impressive, it was not as large as it should have been—a fact recognized by many companies.

In November and December, top executives of literally thousands of large companies (employing one hundred or more) decided to check their Payroll Savings Plan and endeavor to increase participation to 60% or more.

Here are a few December reports: in one of the larger units of a leading steel corporation, participation went from 20% to 80.6 per cent . . . a well-known independent steel company (13,710 employees) reported 82% participation . . . another large steel company (100,000 employees), 75% participation . . . one plant of a large rubber corporation climbed to 94% (company average, all plants, 70%—and still going up). Tabulation of all companies exceeding 60% participation in December would literally fill this page.

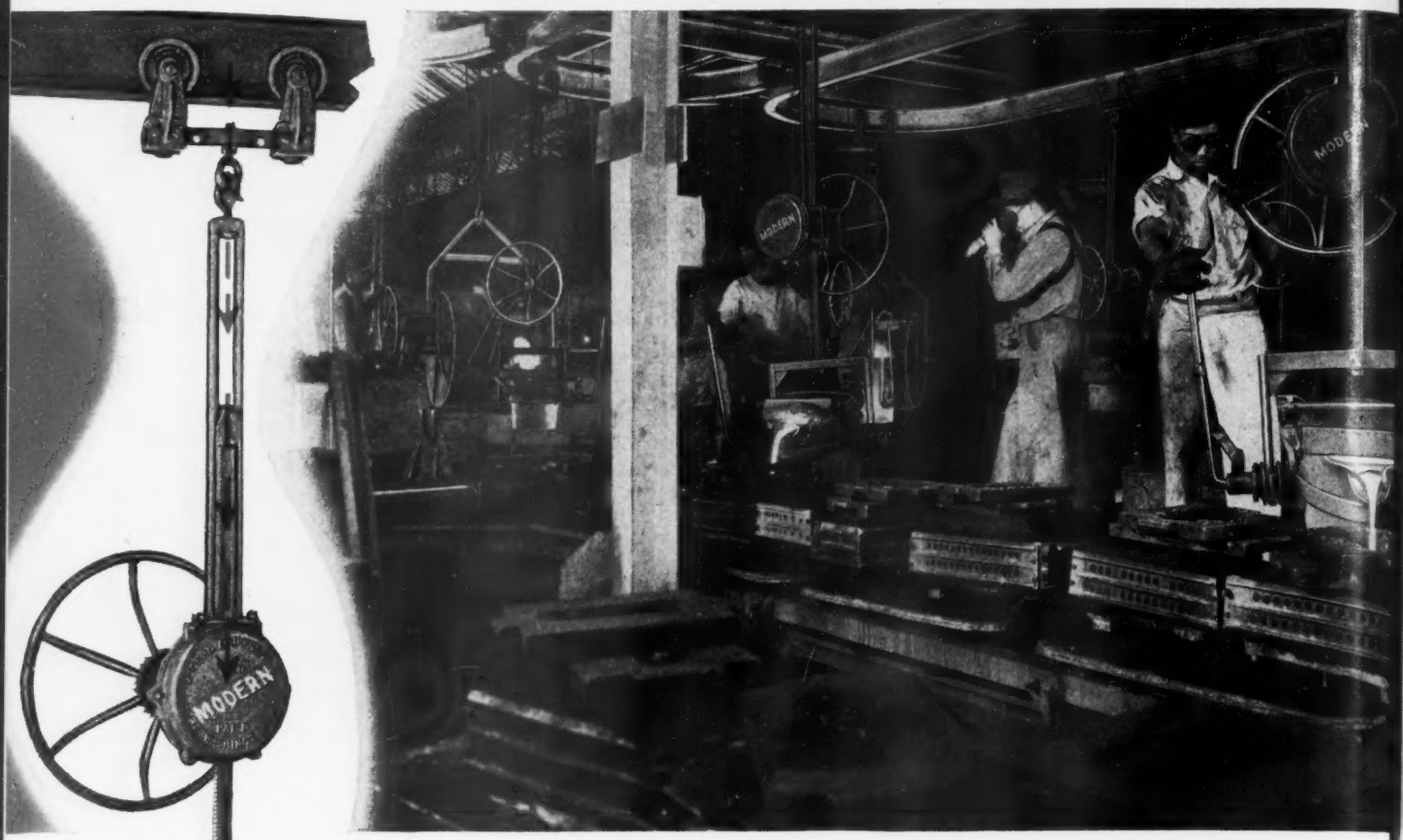
Higher participation in the Payroll Savings Plan is good for the men and women for whom it builds security. It is good for the company because a saving employee is a better workman, a better citizen. It is good for the country because the month after month purchase of U. S. Savings Bonds by millions of Americans is a most effective check on inflationary tendencies.

Phone, write or wire, now, to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D.C. Your State Director has a simple, four-point promotion plan, concluding with a person to person canvass that puts a Payroll Savings Application Blank in the hands of every employee. That's all you have to do—and you'll be surprised at the response from employees who *want* to save.

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

FOUNDRY

A LIFT *for your* POUR-OFF-MEN



Rigid, straight-line control from monorail to ladle spout for quick accurate spotting over the sprues.

WORKING TOGETHER WITH PRACTICAL FOUNDRYMEN...

MODERN engineers developed the Pouring Device. That's how our business began!

Today this MODERN one-man-pouring method, as proved in a quarter century's service to foundries, is highly productive — both for the foundry that sets up a floor or two a day, as well as for the large manufacturer* with his most elaborate, double-loop conveyor system.

The MODERN cylindrical ladles, together with their 2000 pound loads of gray iron, are trucked from the cupolas to the pouring floor. In this MODERN equipped operation up to 70 tons of tractor cylinder liners, heads and manifolds are poured in an 8 hour shift. Several of the ladles and the MODERN "FA" Pouring Devices have been in operation since 1938. Herein is a timely story on the effective distribution of manpower. You can read more about it in catalog 147: It's free to foundrymen who make request on their company letterheads to — Dept. F-3, MODERN EQUIPMENT COMPANY, Port Washington, Wisconsin.

*Allis-Chalmers, Milwaukee

MODERN EQUIPMENT CO.
PORT WASHINGTON, WISCONSIN

OTHER FREE CATALOGS

Large Ladles . . . . . No. 149
Cupolas and Chargers . . . . No. 147-A
Monorails, Cranes, Switches . No. 150

Let *Stevens* Quality Facings Solve Your Casting Problems

For over a half-century, Frederic B. Stevens, Inc., has consistently set the pace in developing new products and improving old formulas to make foundry operations easier and more efficient. This leadership can be attributed directly to the basic Stevens policy of combining Research, Development and Control in a logical pattern to provide customers with the very best products for every specific requirement. We invite inquiries covering your foundry problems. Let us show you the benefits Stevens facings can bring to your casting operations. Call in your nearby Stevens representative today or write to Frederic B. Stevens, Inc., Detroit 16, Michigan.

PLUMBAGOS

High heat resistance. Smoother casting surface. Castings clean easier. Easy to apply. Make shakeout faster and easier.

CORE PASTES

Have good "green grab"—high tensile strength. Will not boil or swell out of joints. A grade for every purpose.

LIQUID PARTING

Economical—gives 20 to 60 molds per application. Eliminates dust from molding areas. Ideal for patterns for plaster molds—for match plates, loose patterns or core boxes.

CORE AND MOLD WASHES

Mix easily with water. Stay in suspension. Adhere firmly. Smooth, uniform coverage. Can be applied by brush, spray or dip. Reduce metal penetration. Easy, clean peel of sand from castings.

DRY PARTINGS

Safe to use. Economical. Make pattern lifts easier. Part sand cleanly from sand or pattern. Completely waterproofed.

MUDDING COMPOUNDS

Feed easily under thumb or fingers. Will not crumble or roll up. Will not curl under heat. Will not shrink, crack or peel. Prevent fins at joints.

PITCH CORE COMPOUNDS

Reduce cost three ways—cut down amount of new core sand used; allow use of old, burnt sand and gangway sweepings; reduce amount of compound used in proportion to the amount of reclaimed sand.

SEACOAL

Uniform grain size—jet black. Gives cleaner, smoother castings, easier shakeout. A grade for every purpose.

EVERYTHING FOR A FOUNDRY

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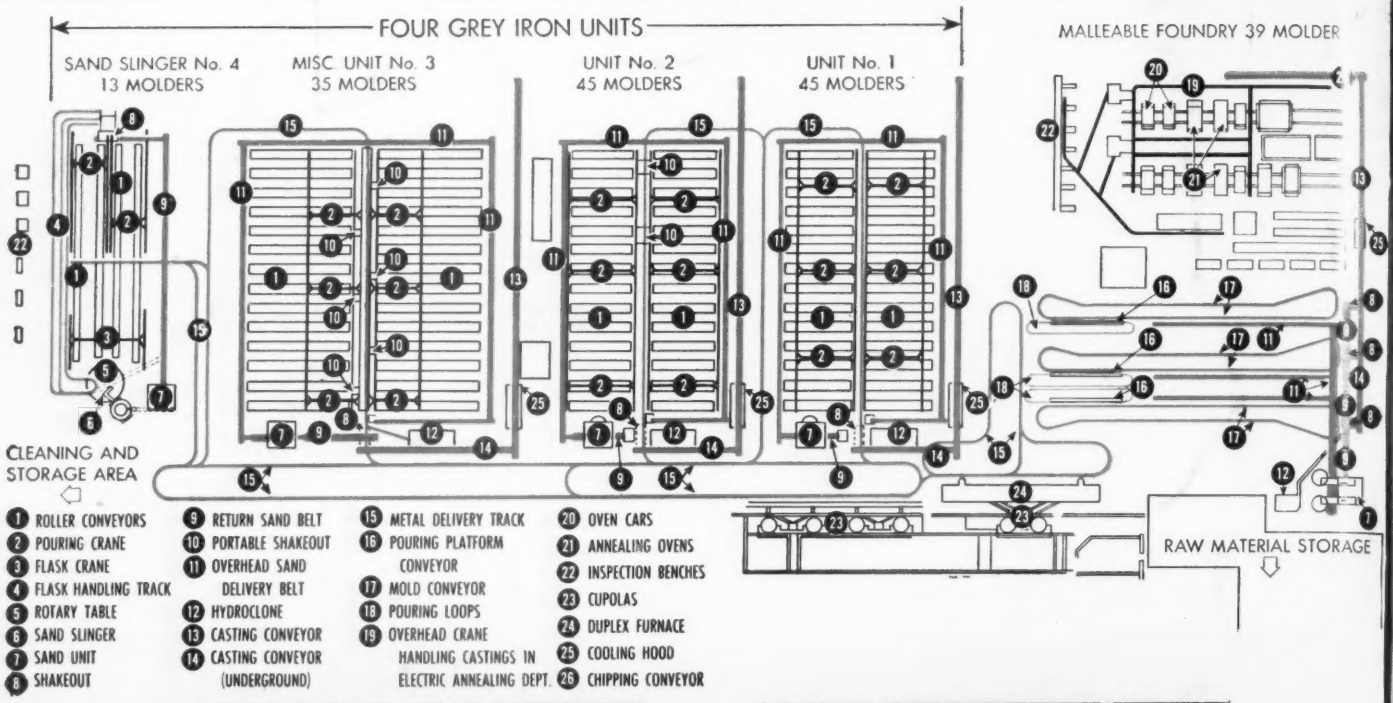
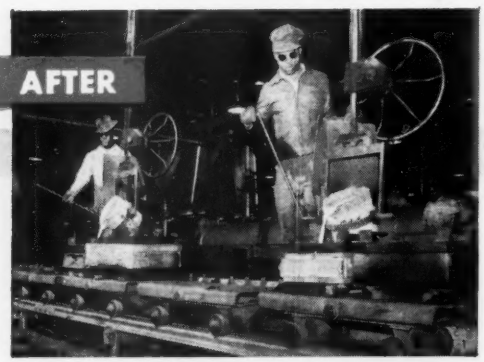
LINK-BELT mechanization...

doubles malleable production, conserves valuable manpower



In old foundry two men had to lift ladle. Pouring was back-breaking and dangerous. Production suffered because of physical limitations.



With ladle suspended from overhead carrier, attendants riding on platform conveyor synchronized with mold conveyor, pour all day without getting overtired.

Four new grey iron units at Oliver Corp. also increase output, improve working conditions . . .

From drawing board to completed castings, Link-Belt foundry engineering and equipment offer new highs in efficiency . . . new lows in operating costs . . . new improvements in manpower utilization. Far better working conditions for production-hungry foundries.

Let's take a look at just four steps at the Oliver Corp., South Bend, Ind. Here Link-Belt straight-line mechanization has multiplied output on one malleable and four grey iron production units, utilizing only the existing labor force.

Molding—Formerly sand was hand-shoveled and molds hand-carried to foundry floor. Now Link-Belt Tru-Trac mold conveyors carry molds from molding stations, through pouring and cooling, to central shakeout. Individual overhead sand hopper and his own core rack let a molder work fast, efficiently.

Pouring—Instead of laborious hand-pouring, ladles are suspended from overhead monorail carrier. Pourers stand on platform conveyor moving at same speed as mold conveyor. Mechanical controls tilt, raise and lower ladles.

Cooling—No more noxious smoke and fumes. Cooling hood collects and exhausts all gases—makes foundry more healthful, less fatiguing place to work.

Sand preparation—Hand-wetting and cutting was messy—resulted in poorly prepared, non-uniform sand. Link-Belt preparation plant automatically screens, blends, mulls, aerates and returns sand to molders' hoppers.

Remember, Link-Belt engineers and builds sand preparation and complete handling facilities for any type of foundry, melting 10 tons to 1000 tons a day. You can have a Link-Belt foundry specialist at your plant almost as quickly as you can call your nearest Link-Belt office. Why not discuss your foundry problems with him?

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

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CONVEYORS and PREPARATION MACHINERY 12.231

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